INEEL/INT-2001-00798

September 2001

INEEL Consolidated Laboratory Complex Project (Draft)

Response to Performance Evaluation Measure 2.3.4.1 (Part 1)

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SUMMARY

This *INEEL Consolidated Laboratory Complex Project DRAFT* describes the most cost-effective solution for several critical-mission laboratory needs at the Idaho National Engineering and Environmental Laboratory (INEEL). The INEEL Consolidated Laboratory Complex (ICLC) Project will replace and consolidate 185,000 square feet of dated and deteriorating analytical, environmental, nuclear research, and radiological support laboratories from 13 different facilities at the INEEL site. The project will also provide about 10,000 square feet of process development support space for waste treatment and other related research functions, and approximately 11,000 square feet of radiological capability for the INEEL's Subsurface Geosciences Laboratory.

The primary objective of the project is to provide the infrastructure necessary to sustain laboratories that will support timely remediation of INEEL hazardous and radioactive wastes and selected research and development activities in accordance with the INEEL Institutional Plan. This action will also significantly reduce the funding gap between life-cycle capital needs and expected capital funding levels.

Initial scoping of this line-item construction project (LICP) involved listing INEEL laboratory facilities that are vulnerable to being condemned for environmental, safety, and health reasons. The major facilities on this list include the CPP-602 Laboratory/Offices Building, CPP-620 Chemical Engineering Laboratory High Bay, CPP-630 Safety/Spectrometry Building, CPP-637 Process Improvement Facility, and CF-690 Radiological and Environmental Sciences Laboratory. Other analytical, program support, and field sampling support laboratories at the Central Facilities Area (CFA), Test Area North, and the Test Reactor Area will also be replaced by the ICLC. Typical problems with the existing facilities include failing systems and numerous code deficiencies.

Recommendation

Following eight months of evaluations, the alternative shown to best meet the mission need criteria is to construct a new 150,000 ft^2 ($87M) laboratory facility at INTEC and lease a new 65,000 ft^2 (lease cost of $20.00/sf/year for 10 years for a total of $13M) laboratory facility in Idaho Falls. The preconceptual total project cost (TPC) estimate of this alternative is $100 million. This project will provide reduced operating and maintenance cost savings of $4M annually and contribute over $164M in avoided capital upgrade/replacement costs. As a result,

the INEEL infrastructure funding gap in 2010 is reduced by over $164M (Figure S-1). Other benefits include: lowest life-cycle costs (see Table S-1) for alternatives meeting the full INEEL laboratory mission, leased laboratory in Idaho Falls is more favorable to R&D initiatives, and maximum space for minimum cost.

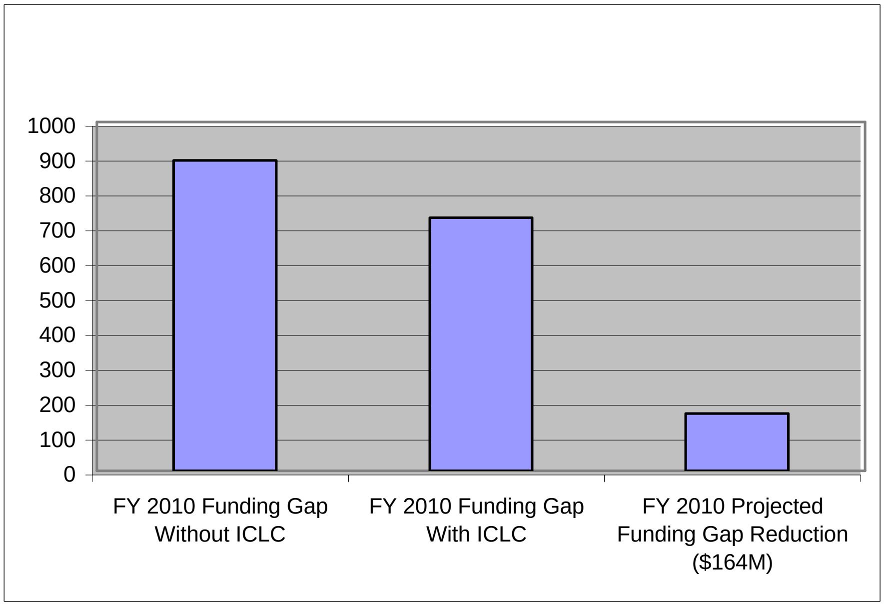


Figure S-1. Capital gap comparison ($M), fiscal year 2010.

Table S-1. Total Project Costs and Life-Cycle Cost Comparisons

	1 Do Nothing	2 Upgrade Existing Labs	3 New High-Level Lab at INTEC only	4 New High-Level Lab at INTEC and Low-Level Leased Labs in Idaho Falls	5 New High-Level Lab at INTEC and Low Level Lab at CFA
Life-Cycle Cost Total Discounted ($M)	312	289	215	242	269
Total Project Cost	0	80	98	100	128

Complete Life Cycle Cost Estimates are available upon request.

Alternatives

Five major alternatives for meeting mission-critical INEEL laboratory needs are summarized here; others are briefly discussed in the text. A list of evaluation criteria was developed by the project team. The criteria were reviewed to eliminate duplicates and refine them into a valid set of discriminating criteria. Weights were assigned to the final set of criteria using the group's expertise and judgement based on the relative importance of maintaining the project TPC of $100M and achieving goals and strategies of the INEEL Institutional Plan. A decision analysis matrix was used to summarize scores of the options against the criteria and is located on the last page of this summary. A summary of the Keptner-Trego (K-T) analysis is given at the end of this summary.[1] A brief discussion of the alternatives considered is as follows:

1. **Do nothing.** This alternative jeopardizes INEEL Environmental Management and research-and-development (R&D) missions by pushing solutions to the laboratory infrastructure problems out to unknown dates, beyond needed replacement dates, and outside the realistic LICP funding timeframe**.** Facilities would continue to deteriorate until they are no longer useable. This alternative has the lowest capital cost ($0) but the highest life cycle cost ($312M) of the alternatives considered.

2. **Replace systems/parts of existing laboratory facilities.** This alternative would replace the worst facilities on a like for like basis (CF-690, CPP-602, CPP-620, CPP-630, CPP-637) and would provide upgrades to roofs, mechanical, HVAC, and electrical systems to other facilities (CF-612, CF-625) in accordance with the Long Range Plan. This $80M upgrades alternative would seriously impact ongoing laboratory work while the construction upgrades were being performed, especially since there is a lack of temporary laboratory space. Construction activity would be continuous. The already aging facilities cannot be expected to last another 35 years.

3. **Build a new 160,000 square foot high level facility at the Idaho Nuclear Technology and Engineering Center (INTEC) with no upgrade to the Radiological and Environmental Sciences Laboratory (RESL).** This alternative requires a considerable amount of new space to support the analytical and R&D laboratories that need to be replaced. This alternative also retains INTEC's low-level analytical and R&D functions from CPP-620 and –637, which could more cost-effectively be relocated to Idaho Falls. This alternative does not include upgrades or improvements to RESL or other low-level laboratory functions (for example, bioassay and dosimetry) located at CFA or TRA.

4. **Build a new 150,000 square foot high level facility at INTEC with new leased low level laboratories in Idaho Falls.** This alternative provides substantially more space (55,000 sq. ft.) with almost the same project funding level as Alternative 3. It includes 65,000 square feet of new leased laboratories for low-level rad and cold functions currently performed at the site that could be performed in Idaho Falls. The DOE RESL facility would be relocated to Idaho Falls into the new leased facility under this alternative. It scored the highest K-T total weighted score. Preliminary cost estimates indicate it is only $2 million more than Alternative 3. In addition, it provides the best high level life-cycle cost savings for full mission support as indicated by the comparison in Table S-1.

[1] Other options are discussed in the body of the text.

5. **Build a new 160,000 square foot high level facility at INTEC and a new 65,000 square foot low level facility at CFA.** This alternative is the second best solution, but it is the most expensive alternative at $128 million. Additionally, it does not fit the current planning philosophy of reducing activity (site footprint and costs) at CFA.

A summary of existing facilities and functions, and projected facilities and functions is shown in Table S-2.

Under the umbrella of redefining how work is done at the INEEL initiatives such as improving the sampling process, coordinating on-site analytical services, and increasing the use of off-site laboratories are being evaluated. Results of these ongoing BBWI laboratory efficiency initiatives will be incorporated into the conceptual design of the ICLC. Conceptual design activities will also include the impacts on the ICLC scope of the pending reduction in force expected in early FY02.

Table S-2. Square footage estimate for the ICLC.

Existing Facility	Condition	Existing ft^2	Offices	Labs	Replacement ft^2 via ICLC	Offices	Labs	Functions	Potential to Lease in Idaho Falls	Replace at Site
CPP-602	Poor	47,628	36	27	63,000	36	27	Analytical support for HLW, SNF, all of INEEL		XX
CPP-630	Poor	22,090	18	7	16,000	23	7	Mass spectrometry for HLW, SNF, all of INEEL		XX
CPP-637	Poor	32,400	54	9	30,000	60	10	Pilot and process operations for waste, groundwater, separations, decon, offgas technologies	XX	XX
CPP-620	Poor	4,418	0	2	13,000	0	2	Pilot testing/technology demonstration	XX	XX
Subtotal		106,536	108	45	122,000	119	46			
CF-612	Fair	9,855	4	3	6,000	4	3	Industrial hygiene sample analysis	XX	
CF-625	Fair	7,533	15	12	12,000	18	5	Bioassay, headspace gas analysis, gcms	XX	XX
CF-638	Fair	1,030	0	3	4,000	1	2	Radiation calibration laboratory	XX	
CF-690	Very Poor	32,238	40	25	50,000	40	25	DOE QA and reference laboratory, BBWI dosimetry	XX	
CF-689	Fair	5,000	2	2	4,000	2	2	Environmental monitoring & surveillance	XX	
Subtotal		55,656	61	45	76,000	65	37			
TRA-604A	Poor	5,000	5	8	4,000	2	2	Non ATR radioanalytical analysis in support of sitewide environmental monitoring	XX	
TRA-666	Poor	4,320	10	4	5,000	5	2	Tritium laboratory		XX
TRA-661	Fair	2000	6	1	2,000	2	1	Non ATR radioanalytical analysis in support of sitewide environmental monitoring	XX	
Subtotal		24,524	21	13	11,000	9	5	**Only TRA functions not supporting ATR are being proposed for inclusion in ICLC**		
TAN-604	Fair	12,364	5	5	5,000	1	3	High temperature radioactive materials testing		XX
SSI-HiLL	New	0	0	0	11,000	15	5	New functions		XX
Grand Total		**185,876**	**195**	**108**	**225,000**	**209**	**96**		**65,000**	**160,000**

Note: Check ft^2 = (((offices × 120 ft^2) + (labs * 1,000 ft^2)) *1.30 for circulation) *1.30 for mech/elect/support

Drivers

The overpowering drivers for capital replacements and/or upgrades are the schedules and legal milestones for the INEEL programs. For example, high-level waste has to be treated and ready for shipment out of Idaho by 2035 in order to meet the requirements of the 1995 Settlement Agreement/Court Order between the US Department of Energy (DOE), the Navy, and the State of Idaho. Repackaging and shipments of spent nuclear fuel will take place during this same timeframe in accordance with the Spent fuel Settlement Agreement. Other drivers requiring sample analyses and laboratory services include the Federal Facilities Agreement and Consent Order between the Environmental Protection Agency, the State of Idaho and DOE; and the *Site Treatment Plan* approved by the State of Idaho.

A secondary driver is to maintain the INEEL as the DOE's lead laboratory for Environmental Management. Analytical and R&D laboratory facilities need to be sufficient to support this goal and to provide the nation with environmental science and engineering solutions.

This project also supports five of the seven initiatives of the INEEL Institutional Plan: Subsurface Science – via construction of five special high level laboratory modules dedicated to new subsurface science functions; Long-Term Environmental Stewardship via replacement of existing process development space (CPP-637 and CPP-620); Waste Treatment and Disposition, via replacement of deteriorating analytical laboratories (CPP-602 and CPP-630) required to help meet Settlement Agreement milestones; Generation IV Nuclear Reactor via replacement of research and fission safety laboratory modules from TRA and TAN and Critical Infrastructure by providing the ICLC to meet the needs of the laboratory science and engineering missions in a cost-effective manner.

Benefits

The primary benefit of constructing a new laboratory complex is an INEEL infrastructure that has the proper facilities to perform the assigned missions in a safe, cost-effective, and timely manner, a strategic goal of the *FY 2001-2005 INEEL Institutional Plan*. Specific benefits of the recommended Alternative 4 include:

- It is only \$2 million more than Alternative 3 (with initial capital outlays approximately \$10 million less, \$89M vs \$98M), and more laboratory space is ultimately available, so there is a bigger "bang for the buck."

- The new facilities life-cycle costs of \$242 million are the lowest of the alternatives providing full mission support.

- The approximate \$41 million in avoided costs of upgrading/replacing existing facilities are the highest among the alternatives evaluated (see Appendix A).

- No expenditures to operations or mission impacts will result from construction activities.

- Leased space could be provided ahead of time, and the laboratories could be moved to Idaho Falls before the INTEC facility is finished, yielding savings and some avoided costs as many as three years sooner.

- A third-party lease arrangement can be pursued much like that planned at Oak Ridge National Laboratory. If successful, the TPC of this LICP could be reduced by up to \$13 million. (Note: The $13M is required as reserve to satisfy OMB Circular A-11. The money is not actually spent and is reduced by the amount of the lease each year).

- High level and low level functions can be segregated.

- Exposure to future non-compliant findings (OSHA, etc.) is less. (An analysis of maintenance work orders in October 2000 demonstrated the deteriorating condition of the CPP-602 and –630 facilities. There were 75 facility deficiencies identified, with some very significant, affecting the operation of the labs).

- The probability of obtaining and retaining high-caliber scientists is enhanced because of new modern laboratory facilities at the INEEL site and in Idaho Falls.

- Vacating 162,192 ft^2 (106,536 ft^2 at INTEC and 55,656 ft^2 at CFA) of deteriorating laboratory space.

- A leased facility will eliminate future mortgage costs for decontamination and dismantlement by up to $2.9 million over an owned facility.

- It supports the R&D mission, which is part of the DOE-approved institutional plan.

- The Idaho Falls leased laboratories will be able to more effectively collaborate with INRA and the INEEL Research Center.

- RESL will be moved to Idaho Falls and close to DOE-Idaho offices.

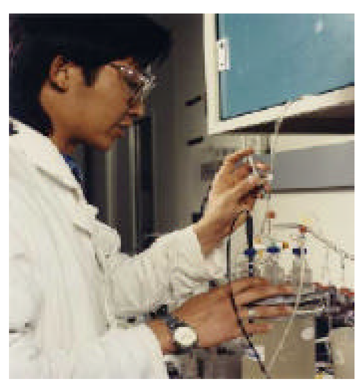
- It will enhance the ability to match site-required/site-optional INEEL laboratory requirements.

- It passes risk for design and construction for approximately 30% of the project to the private sector.

- It provides the DOE’s lead Environmental Management laboratory with the infrastructure to fulfill its missions.

Through Facility Closure, Alternative 4 saves over $5.5M (162,192 x $34/sf)in maintenance costs annually by not having to maintain deteriorated facilities and provides approximately $164 million in avoided capital costs, it reduces the capital funding gap by 20% (see Figure S-1). While the project mitigates mission-critical, environmental, safety, and health issues, it also contributes to significant avoided costs related to accidents, lost productive time, and government fines. However, it would be difficult to estimate such cost impacts. And, as with most life-cycle facility needs, the continuing deterioration resulting from deferred maintenance will significantly accelerate the future repair/restoration costs of existing facilities.

Project Development



The basic elements of the ICLC Project evolved many years ago in the form of general plant project forecasts and requests. Since then, the mission needs have been getting more pronounced, and combining the needs into an LICP request makes good economic sense. Because of this evolution, the various alternatives have been discussed frequently. Even adaptive reuse of the Fuel Processing Facility (FPF) was, at one time, seriously considered as a viable alternative. A feasibility study and cost estimate were even prepared.

A major mission for the ICLC is to provide new facilities to cost-effectively meet the required sampling load over the course of the coming decades. Figure S-2 shows the number of samples by customer that constitutes most of the expected analytical laboratory sampling load. No R&D sample loadings are included here. The size of the analytical portion of the ICLC is based on this throughput. Other areas of the ICLC are sized based on similar requirements.

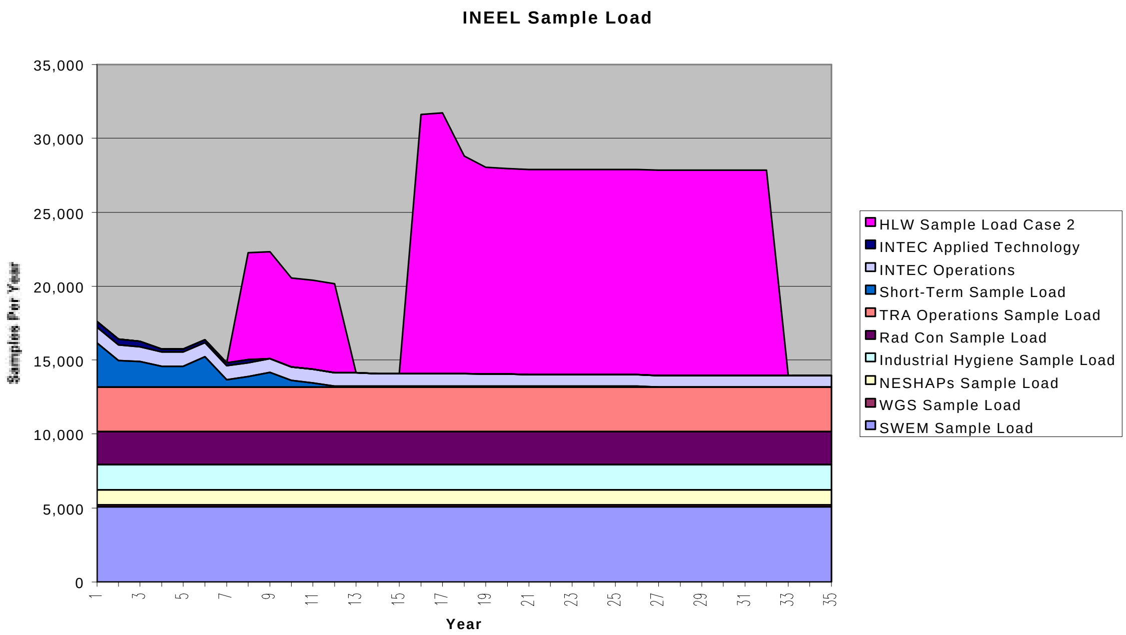


Figure S-2. Projected analytical sample load.

NOTE: Base sample analysis capacity = 14,000 for labs other than INTEC +10,000 for INTEC = 24,000. Shortage shown above represents sampling requirements for full separations load. Existing capacity is sufficient to handle future demands for early vitrification process samples.

The INEEL requires a full capacity lab, able to meet unexpected condition and events. Past experience has demonstrated the need to analyze non-routine samples caused by such things as process upsets, contamination source determination or rework of off-spec product. Previous experience has also shown extensive, general capabilities to be essential. The current regulatory climate and higher level of scrutiny make the requirement for advanced analytical methods more rather than less necessary than in the past.

The needs for the current five major alternatives have been assessed. A facilitated decision analysis procedure was used to quantify the decision process and is summarized in Figure S-3.

CD-0 Requirements

A team leader and a certified project manager are guiding the process though the Critical Decision (CD)-0 phase for this important project proposal. CD-0 deliverables for this LICP that are the responsibility of the management and operations contractor include:

Justification of Mission Need, which cites that 80% of the mission-critical laboratories are in poor or very poor condition. The programs they support will not end until after the year 2035. It is absolutely essential that these infrastructure problems be resolved within the next five years or major program and mandated milestones will be seriously threatened.

Acquisition Strategy, which recommends using in-house personnel, complemented with specialized laboratory consultants for conceptual design. For the INTEC facility, title design may be subcontracted to an outside firm that specializes in laboratories or performed using in-house resources supplemented with specialized laboratory consultants. Procurement and construction management will be provided by the management and operations contractor. The leased facility in town would be designed, constructed, and leased back to the management and operations contractor by a private-sector firm.

Preliminary National Environmental Policy Act (NEPA) and Permitting Strategy will be developed during the conceptual design phase and submitted to the management and operations contractor's environmental affairs department.

Project Technical and Organizational Interfaces are extensive, covering ongoing capital project proposals and most of the laboratories that support the major programs.

A Project and Engineering Design funding request was submitted in mid 2001 in compliance with DOE Order 413.3. Technical and functional requirements are being developed, and a technical risk evaluation will be submitted in the CD-0 package. The work is being accomplished through a project team composed of contributors and specialists from INEEL Analytical, R&D, and Operations.

Alternative Analysis for each of the major alternatives was performed as summarized above. More details on the alternatives is discussed in the mission need document.

An initial risk management plan was developed, and impacts were evaluated. Areas of technical risk above normal project risks were identified, and actions were assigned for tracking them throughout the project to ensure they are properly mitigated. No serious technical problems that could adversely affect building design, construction or operation were discovered. This risk assessment will be expanded into a risk management plan once mission need approval is given and conceptual design begins.

Preliminary Technical and Functional Requirements for the proposed laboratory complex will be completed in September. Major design requirements are listed in the mission need document. In addition, earlier BBWI Internal Reports including the *Customer Requirements for INEEL Sample Analysis Services* and the *Scoping Study for INEEL Analytical Facilities* provided best estimate numbers about the variety and numbers of samples by customer for a majority of the samples expected in the next 35 years, further validating the need for this project.

Technology Development is not required for the project proposal, since the technologies being employed for the ICLC facility construction and operation are basically available off-the-shelf.

Decision Analysis Matrix

10 = Excellent
0 = Poor

ICLC Building Configurations/ Locations

August 7, 2001

#	Criteria	Wt. %	Options: 1 Do Nothing TPC Cost: 0	Options: 2 Replace Parts of Existing Lab Facilities TPC Cost: $80M	Options: 3 New Facility at INTEC (No Upgrade to RESL) TPC Cost: $98M	Options: 4 New Facility at INTEC with Lease Labs in IF TPC Cost: $100M	Options: 5 New Facility at INTEC/ Remodel RESL & Add New Addition (CFA) TPC Cost: $130M	Justification
1	**Minimize TPC** Score / Criteria 7,8,9,10 = ≤$75M 4, 5, 6 = >$75M to ≤100M 1,2,3 = >$100M	40	10 / 400	6 / 240	4 / 160	4 / 160	2 / 80	Option 4: TPC are $87M for the INTEC Facility (150,000 sq. ft.) and $13M for the IF Leased Labs ($20 per sq. ft. X 65,000 sq. ft = 1.3 M. The INEEL can lease for a maximum of 10 years).
2	**Minimize Life Cycle Cost-2035**	25	2 / 50	3 / 75	6 / 150	9 / 225	10 / 250	Life Cycle Costs include costs after construction and avoidance costs (gap reduction). Do nothing and upgrades will not minimize life cycle cost. Leased facilities are more expensive over the life of the facility.
3	**Meet Compliance/ Mission Need of Labs**	15	1 / 15	2 / 30	8 / 120	10 / 150	9 / 135	Option 4: Meets compliance to the Batt Agreement, WAG RODs, NRC regulations, etc. and provides optimal lab facilities in IF for low level analysis.
4	**Reduce INEEL "Old" Footprint (sq. ft.)**	10	1 / 10	1 / 10	6 / 60	10 / 100	8 / 80	Option 4: Reduces the square footage of existing facilities the best. INEEL footprint applies to the site areas, not IF facilities. 65,000 sq. ft. of labs could move to IF.
5	**Meet R&D Mission/ Leading Edge Technology**	5	3 / 15	4 / 20	7 / 35	10 / 50	8 / 40	A new facility at INTEC has more versatility to meet R&D needs, but Option 3 has no RESL upgrade. Leased Labs in Idaho Falls provide incentive for potential new scientists to relocate to IF.
6	**Satisfy ESH&Q**	5	1 / 5	4 / 20	7 / 35	10 / 50	9 / 45	A new facility and leased labs mitigate safety issues the best.
TOTAL WEIGHTED SCORE			**495**	**395**	**560**	**735**	**630**	

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Figure S-3. Decision analysis matrix.

CONTENTS

FIGURES

TABLES

ACRONYMS

A-E	Architectural Engineering
ANL-W	Argonne National Laboratory-West
ATR	Advanced Test Reactor
BBWI	Bechtel BWXT Idaho, LLC
BNFL	British Nuclear Fuels Limited
CD	critical decision
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	Central Facilities (building designator)
CFA	Central Facilities Area
CPP	Chemical Processing Plant (INTEC building designator)
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ES&H	Environment, Safety, & Health
FFA/CO	Federal Facility Agreement and Consent Order
FPF	Fuel Processing Facility
FY	fiscal year
HLW	high-level waste
HVAC	heating, ventilating, and air conditioning
IBC	International Building Code
ICLC	INEEL Consolidated Laboratory Complex
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ISMS	Integrated Safety Management System
LICP	Line Item Construction Project
NEPA	National Environmental Policy Act

NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
PNNL	Pacific Northwest National Laboratory
RAL	Remote Analytical Laboratory
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RESL	Radiological and Environmental Sciences Laboratory
RWMC	Radioactive Waste Management Complex
SERF	Site Engineering and Resource Facility
SGL	Subsurface Geoscience Laboratory
SNF	spent nuclear fuel
SRS	Savannah River Site
SSI	Subsurface Science Initiative
SSI-HiLL	Subsurface Science Initiative-High-Level Laboratory
TAN	Test Area North
T&FR	technical and functional requirement
TPC	total project cost
TRA	Test Reactor Area
TRU	transuranic
UBC	Uniform Building Code
WIPP	Waste Isolation Pilot Plant

INEEL Consolidated Laboratory Complex Project

1. MISSION NEED

The Idaho National Engineering and Environmental Laboratory (INEEL) infrastructure consists of facilities, structures, and utilities that support the Department of Energy (DOE) mission areas of Environmental Quality, Energy Resources, National Security, and Science and Technology. The INEEL infrastructure supports specific missions in the areas of hazardous-waste storage, treatment, remediation, and disposal; spent nuclear fuel (SNF) storage and disposal; packaging and shipping of waste forms to permanent sites; and research and development (R&D) in wastes, nuclear reactors, and scientific technologies. The infrastructure is critical to meeting milestones mandated by the State of Idaho to store, treat, package, and remove hazardous wastes and SNF from Idaho; and to maintaining the infrastructure in a safe, functional condition to protect the public, workers, the environment, and equipment.

The infrastructure is critical to meeting milestones mandated by the State of Idaho….

Failure to adequately fund the infrastructure program has resulted in a gradual deterioration of site facilities, structures, and utilities, thereby inhibiting their ability to support INEEL site missions, meet legal milestones, and maintain a safe working environment without significant maintenance costs and work-arounds. To fully support these missions, the INEEL infrastructure program must be aligned with the initiatives each mission area considers critical to accomplishing its goals and objectives. These initiatives require a diverse but functional infrastructure that is maintained during the life of the mission by adequate investment in upgrades and replacements.

New INEEL laboratory facilities are required to replace aging and deteriorating analytical, environmental, radiological, and technology development laboratory facilities, which provide analysis and verification services for various permitting and monitoring activities. The INEEL Consolidated Laboratory Complex (ICLC) Project (Figure 1), in conjunction with two other projects, proposes to upgrade INEEL mission-critical infrastructure to meet mission needs and reduce overall long-term facility capital upgrade and maintenance costs. The other two projects are the Site Engineering Resource Facility (SERF) and the Infrastructure Restoration/Optimization Project. These three projects propose to reduce the gap between projected out-year funding allocations and funding needs.[1] Without this reduction, the gap is forecast to increase significantly over the next decade, inhibiting the INEEL's ability to support the identified DOE missions. The consolidated laboratory complex would eliminate eight (8) older, high-maintenance facilities by constructing modern facilities that could complete INEEL laboratory missions with minimal life cycle costs. (Life cycle costs of $242M for the recommended alternative vs. Life Cycle Costs of $312M for using existing facilities).

Figure 1. Architectural rendering of the ICLC.

The ICLC is further required to:

- Support Settlement Agreement and Federal Facility Agreement and Consent Order (FFA/CO) chemical analyses of the High-Level Waste (HLW), SNF, Waste Management, and Environmental Restoration programs
- Support requirements of the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) by the HLW, SNF, Waste Management, and Environmental Restoration programs, as well as Site Operations
- Support daily operations at the Idaho Nuclear Technology and Engineering Center (INTEC), Radioactive Waste Management Complex (RWMC), Waste Experimental Reduction Facility, Power Burst Facility, Strategic Manufacturing Center, Advanced Test Reactor (ATR), and Advanced Mixed Waste Treatment Facility
- Support analyses requirements for radiation control, industrial hygiene, and construction
- Assist work for others, including the Navy, Air Force, Army, State of Idaho, Nuclear Regulatory Commission (NRC), and private enterprise
- Provide unique analytical and research capabilities in the fields of criticality control, corrosion, dry cells, debris coolability, fusion safety, and headspace gas analysis
- Support pilot plant, mock-up, and calcine retrieval programs.

The projected analytical sample load to support these needs is shown in Figure 2.

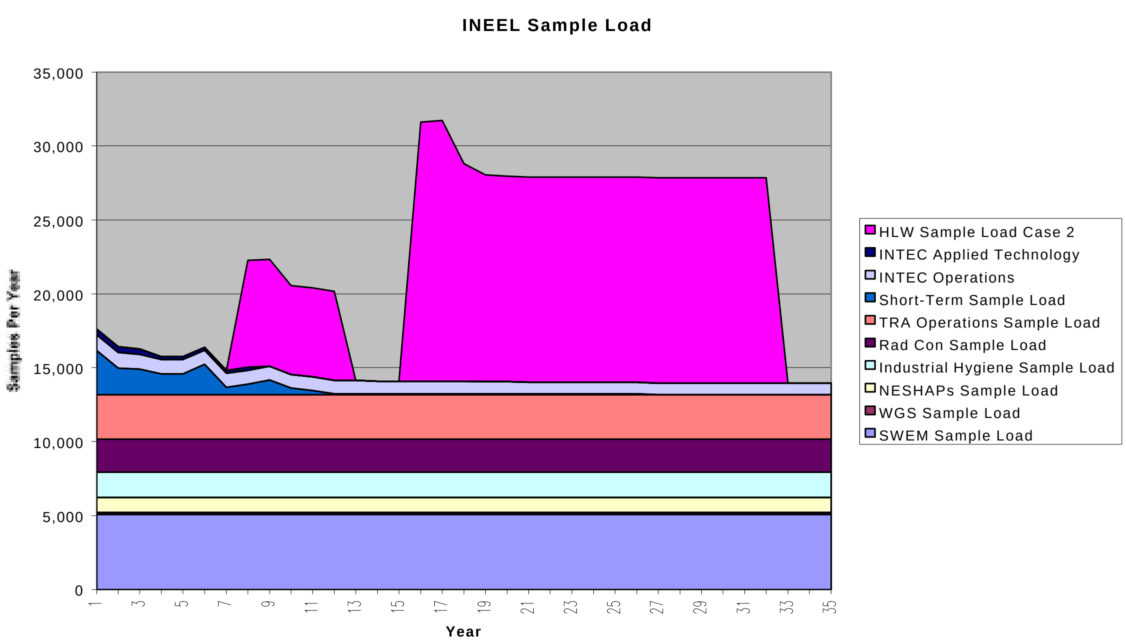


Figure 2. The projected analytical sample load to support the ICLC.

NOTE: Base sample analysis capacity = 14,000 for labs other than INTEC +10,000 for INTEC = 24,000. Shortage shown above represents sampling requirements for full separations load. Existing capacity is sufficient to handle future demands for early vitrification process samples.

The INEEL requires a full capacity lab, able to meet unexpected condition and events. Past experience has demonstrated the need to analyze non-routine samples caused by such things as process upsets, contamination source determination or rework of off-spec product. Previous experience has also shown extensive, general capabilities to be essential. The current regulatory climate and higher level of scrutiny make the requirement for advanced analytical methods more rather than less necessary than in the past.

The needs for the current five major alternatives have been assessed. A facilitated decision analysis procedure was used to quantify the decision process and is summarized in Figure S-3.

“Fair condition” describes 20% of the more than 185,000 ft^2 of laboratory facilities at Chemical Processing Plant (CPP)-602, -620, -630, and -637; Central Facilities Area (CFA)-612, -625, -638, -689, and -690; Test Reactor Area (TRA)-604, 661, and -666, and Test Area North (TAN)-604. Eighty percent of these facilities are in poor or very poor condition (Figures 3 and 4).[1] Facilities have failing ventilation systems (including laboratories that are completely unusable due to collapsed heating, ventilating, and air conditioning [HVAC] ductwork), failing structures, asbestos, hantavirus, inadequate electrical systems, and, in some cases, even fungus growing on the walls. Numerous code deficiencies also exist in the HVAC, electrical, plumbing, and structural systems. Specific deficiencies/deficiencys include:

- Lack of one-hour fire-rated corridor walls (most laboratories and rooms do not meet today’s fire code requirements, and many of the laboratories do not meet exit requirements)
- Insufficient ventilation for handling hazardous materials
- Lack of proper facilities for accumulation of hazardous waste
- Chemical fume hoods in corroding and deteriorating states
- Electrical panels that do not meet current access requirements
- Laboratories and storage rooms containing toxic and flammable chemicals or hazardous biological materials vented directly into hallways
- Nonexistent pressure differentials between areas with different hazard levels
- Exterior walls covered with spray-on urethane foam insulation, which is a fire hazard.

Maintenance costs for the existing facilities is \$34.00 per ft^2 per year due to poor insulation systems, outdated and failing HVAC equipment, deteriorated roofs and wall skins, and constant maintenance. Construction of the ICLC would avoid identified construction and upgrade projects totaling over \$164 million. Current annual maintenance costs for the facilities proposed for consolidation is

$6.3 million (185,876 st x $34/sf). In addition, all of these existing facilities, except CF-625 and -689, are slated for demolition before or during 2012.

The project is replacing 185,000 plus square feet with approximately 225,000 square feet. Space savings realized by consolidating functions into two facilities are offset by the addition of new functions for subsurface science (11,000 sf) and additional high-bay space for process development (9,000 sf). Other increases are required to provide separate corridors for utilities and pedestrians and to increase laboratory module size. Simply replacing laboratories on a like for like square footage basis is not appropriate for today's state of the art laboratory design. Existing laboratories lack adequate sample preparation space, particularly for alpha analysis, which require gloveboxes and adjacent fumehoods as well as additional bench space. Existing radiochemistry counting spaces are extremely crowded. Equipment has been congested in parts of old changerooms and is very inefficient. In the case of RESL, the individual laboratories were originally designed for health services functions and are of insufficient size to properly handle their missions today.

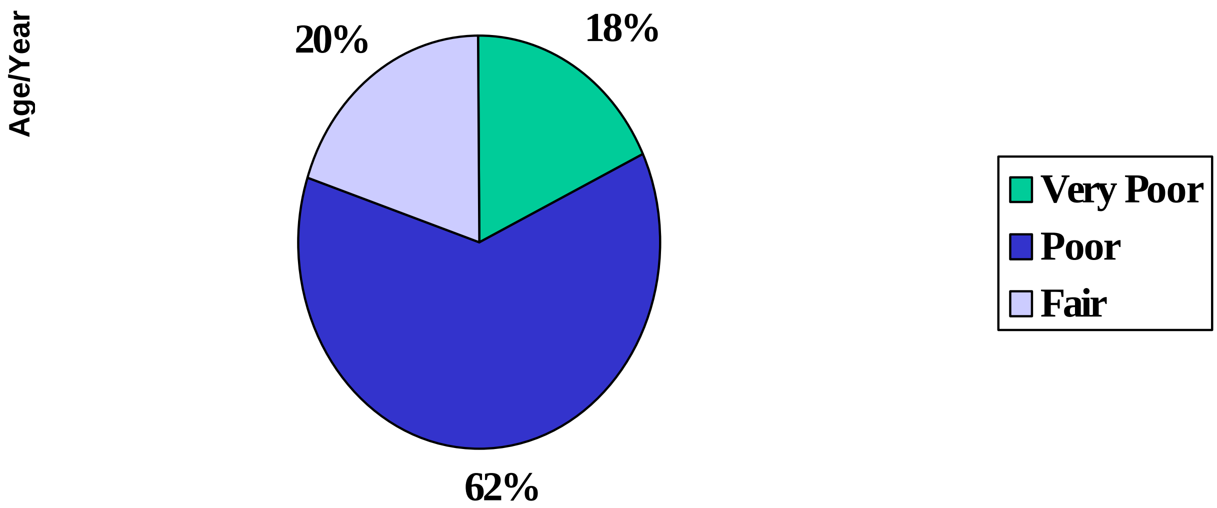


Figure 3. Condition percentages of mission-critical laboratories at INEEL site.

Figure 4. Age of mission-critical laboratory facilities at INEEL site.

Continued use of the existing facilities will increase the potential to negatively impact Settlement Agreement and FFA/CO milestones (for example, if turnaround times on sample analysis cannot be met because nonfunctional laboratory HVAC systems cause instrumentation to be shut down unexpectedly). For instance CPP-602 has been operating with only one half its blowers running for most of the year leading to inefficient use of equipment and facilities.

Loss of capability or capacity from these laboratories could threaten the INEEL's ability to accomplish its mission for DOE.

Poor temperature control is a reoccurring problem, especially in the winter and summer months. Temperature control is essential for operating laboratory equipment. Extremes (noted in labs from 50°F to 100°F) have shut down equipment because of the unreliability of the facilities air conditioning systems. This has been somewhat mitigated by the use of electric fans and keeping the lab and outside doors open. In several instances, free standing air conditioners have had to be installed because of the unreliability of the facilities HVAC systems. These temperature extremes also create poor working conditions for employees.

Frequent water line and steam pipe leaks have caused laboratory shutdowns. Floors have been flooded and equipment damaged from broken over head pipes. This is especially true when steam heat is supplied to the buildings.

Also, a loss of "work for others" and missed R&D opportunities can occur when excess space is subsequently utilized for workaround activities, caused by laboratory shutdowns. The high maintenance and operational costs of these facilities, will continue to grow as will safety and health issues and inefficient workarounds. Loss of capability or capacity from these laboratories could threaten the INEEL's ability to accomplish its mission for DOE.

The new facilities will provide full compliance with the Occupational Safety and Health Administration (OSHA) and environmental protection requirements, International Building Codes (IBCs), National Electric Codes, National Fire Protection Association codes, radiation protection requirements, and industrial hygiene requirements, as detailed in federal and state regulations and DOE orders.

1.1 Idaho Nuclear Technology and Engineering Center Needs–General

INTEC's major current mission is the storage of SNF and the storage and processing of HLW. The long-term mission of INTEC is to transfer all SNF from wet to dry storage, prepare the SNF for long-term disposal, and transfer it to the disposal site. All HLW must be immobilized and packaged to meet long-term disposal requirements. A large investment will be required in facilities, structures, and utilities to meet these objectives by 2035, as required by the Settlement Agreement. The average age of INTEC facilities is 23 years (those INTEC facilities to be replaced by the ICLC average 42 years); however, key laboratory, production/plant, and service facilities are in poor condition and will require infrastructure upgrades to meet life-cycle needs. Portions of the utility systems also need upgrades within the next 10 years to support INTEC's mission.

Significant activity will be centered at INTEC in the next 35 years to complete mission-critical tasks necessary to meet Settlement Agreement milestones and remove all waste and SNF.

Significant activity will be centered at INTEC in the next 35 years to complete mission-critical tasks necessary to meet Settlement Agreement milestones and remove all waste and SNF. Maintenance of INTEC's infrastructure is critical to support the INTEC mission and provide a safe work environment.

Future demands for sampling for an early vitrification process are within the previous peak sample analysis rates for the INTEC laboratory facilities.

1.2 INTEC Needs – Specific Facilities

Specific INTEC laboratory facility needs are as follows:

CPP-602: Analytical laboratories in CPP-602 and -630 consist of chemistry and instrumentation laboratories housed in aging buildings at INTEC. The *INEEL Infrastructure Long-Range Plan*[1] categorizes the facilities as being in poor condition. The CPP-602 facility was constructed in the early 1950s to support general wet-chemistry analyses using hands-on procedures; laboratory instrumentation was almost nonexistent. Since that time, however, requirements for handling radioactive materials have become stricter, and use of laboratory instrumentation has increased significantly. Although CPP-602 was partially refurbished about 15 years ago, ventilation capacity has remained the same and is inadequate to support additional airflow controlled workspace (Figure 5). The laboratories in CPP-602 are reaching the end of their useful life and are scheduled for decommissioning within 10 years. As such, they cannot provide additional containment of radioactive materials and margins of safety for handling hazardous materials required under today's work procedures.

In each of the past several years—three to four instances of poor ventilation have required the evacuation of laboratory personnel. These evacuations have lasted from several hours to several days.

Figure 5. Ventilation capacity in the 1950s vintage CPP-602 laboratories is inadequate to support today's airflow controlled workspace.

The laboratories in CPP-602 provide a full range of analytical capability, supporting the INTEC and INEEL engineering community programs. This capability has proven extremely useful when process problems have arisen or when technical development support was needed to fully understand the chemistry of the process or system under study. In addition, CPP-602 laboratories provide routine analytical capability, including inorganic, organic, and radioanalytical analyses in support of process and waste characterization, especially to meet regulatory requirements. To date, full analytical capability necessary to support operational or technical development, as well as provide routine sample analyses for INEEL regulatory support, has been maintained. The CPP-602 laboratories are the only INEEL site laboratories that can provide this full range of analyses. Other site laboratories are dedicated to the processes they serve. Thus, in replacing the CPP-602 laboratories, a full range of analytical capability must be maintained to support INEEL operations and its institutional plan vision[2] to provide science-based solutions. All CPP-602 functions will be a part of the ICLC and will remain at INTEC. The ICLC will provide office space for 36 personnel and 27 laboratory modules to replace the CPP-602 functions.

CPP-620: The CPP-620 Chemical Engineering Laboratory High Bay facility was constructed in the mid-1960s and provides high bay space for technology development and process-improvement activities related to waste treatment and processing (Figure 6). These are key initiatives of the INEEL Institutional Plan. This facility is in poor condition. Two laboratory modules and approximately 10,000 ft^2 will be provided as replacement high bay space in the ICLC. The CPP-620 functions which are part of the present Environmental Research and Development Laboratory (ERDL) are candidates for relocation to a leased laboratory facility in Idaho Falls. The relocation study will be performed during conceptual design activities.

Figure 6. CPP-620 was built in the 1960s and is in poor condition.

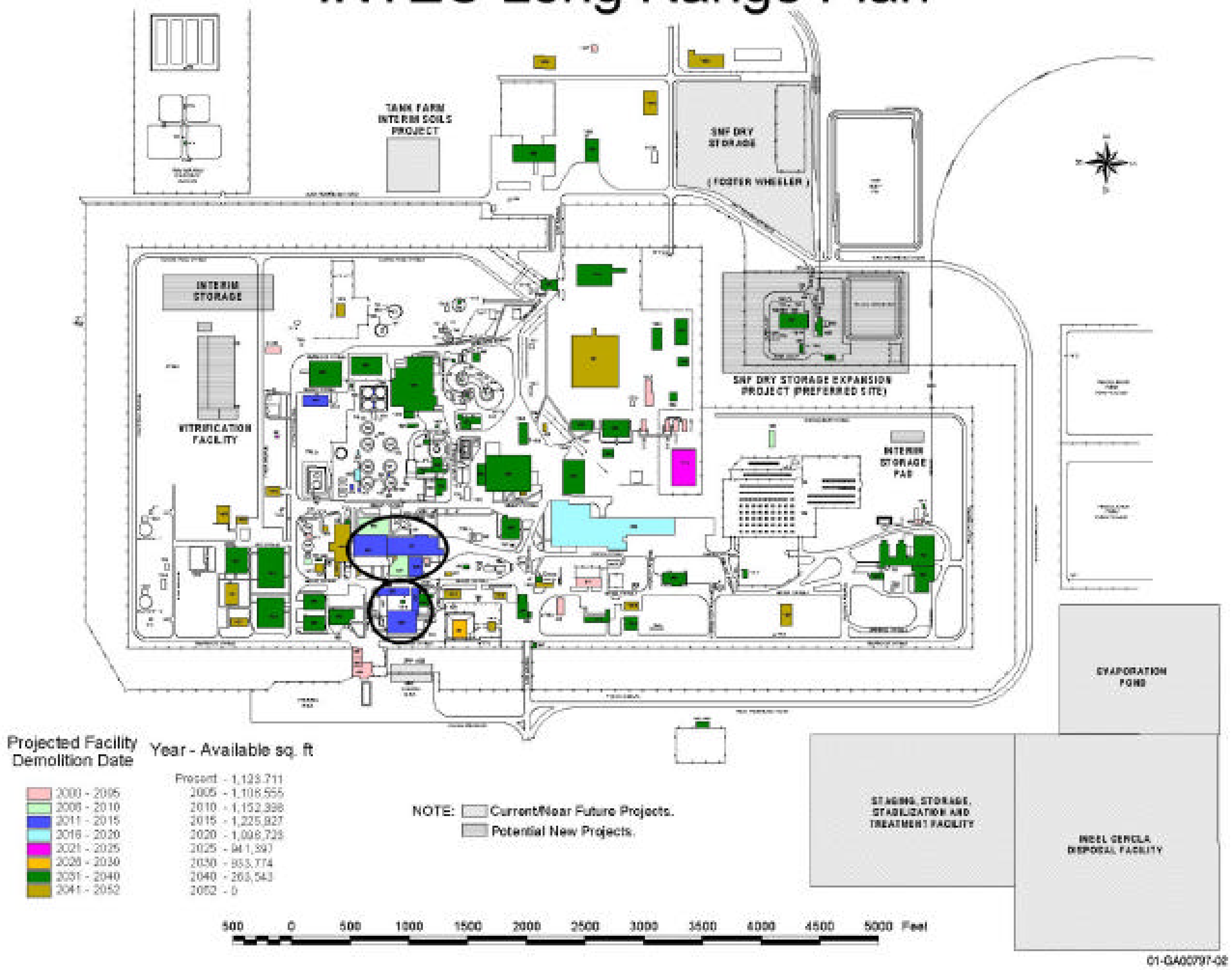
CPP-630: The laboratories in CPP-630 provide space for mass spectrometric analyses for a wide range of sample types (Figure 7). These laboratories are also used to conduct unique measurements in support of SNF storage activities, fuel characteristic measurements, and R&D activities. Most of the instruments in use are no longer manufactured but will still be needed to support operations in the future. Future mass spectrometric analyses will continue to be necessary for monitoring stored SNF, characterizing its properties, and conducting R&D for its decommissioning and disposition. All CPP-630 functions will be a part of the ICLC and will remain at INTEC. The ICLC will provide office space for 23 personnel and seven laboratory modules to replace the CPP-630 functions.

Figure 7. Functions such as mass spectrometric analysis currently housed in CPP-630 will be part of the ICLC.

CPP-637: The CPP-637 Process Improvement Facility dates from 1959 and is in poor condition. The facility houses functions supporting waste-treatment technologies, including solvent extraction, ion exchange, vitrification, grout immobilization, radioactive liquid waste reduction, materials corrosion, off-gas sampling, and microscopy. The ICLC will provide replacement space for 60 personnel and 10 laboratory modules to replace the CPP-637 functions. Approximately one-half of the functions, such as environmental analyses, pilot plant testing, off-gas technology development, and some HLW technology support functions, are candidates for relocation to a leased laboratory facility in Idaho Falls. These relocation options will be evaluated during conceptual design activities.

CPP-684: The CPP-684 Remote Analytical Laboratory (RAL) is an integral part of INTEC's laboratory capability. The ICLC is not replacing the RAL, but the capabilities of the RAL must be maintained to support future HLW processes, particularly if vitrification facilities are constructed at INTEC and/or if the mission of INTEC returns to that of fuel reprocessing to address long-term national energy concerns. The RAL was constructed in 1984 and is not scheduled for decommissioning until about 2035. It currently processes highly radioactive samples and dilutes or extracts the radioactive components so they can be contact handled for additional analyses in CPP-602 and -630. RAL will continue operating to support similar analytical operations at the ICLC, and some upgrades or modifications will have to be made to the HVAC and control systems at RAL. These improvements are planned as a stand-alone general plant project and are not part of the ICLC Project.

INTEC Long Range Plan



1.3 Central Facilities Area Needs

CFA is the service and support center for programs located at other primary facilities in surrounding areas of the INEEL. These services include transportation, maintenance, environmental and radiological monitoring, security, fire protection, warehousing, training, calibration and instrumentation laboratories, medical facilities, and administrative support offices. The average age of CFA buildings is 30 years, and several of the utility systems that support these buildings are as old as 40 years. Replacement of, or significant upgrades to, these buildings and utilities will be required if CFA is to remain in full operation. However, the programs supported by CFA in surrounding areas are concluding in the near future, and support services are diminishing. Consolidation of most of the remaining services at CFA to other areas and inactivation of facilities, structures, and utilities at CFA will save future maintenance and upgrade costs.

The construction of the new ICLC outside of CFA will reduce future infrastructure needs by eliminating laboratory space requirements at CFA. Facilities being vacated by the ICLC include CF-625, -638, and -690.

1.4 CFA Needs–Specific Facilities

Specific CFA laboratory facility needs are as follows:

CF-612: Relocating the industrial hygiene analysis capability from CF-612 to the ICLC will reduce duplication of efforts. Operations currently conducted in CF-612 include sampling and analysis for such things as asbestos, aerosols (metals), paint, organics, and drinking water. Consolidation into the ICLC will provide space for four personnel and three laboratories to replace these operations. This function could be performed in Idaho Falls; however, significant synergistic benefits will be realized by co-locating these functions in the ICLC at INTEC.

CF-625: CF-625, the organic analysis laboratory at CFA, is used to conduct headspace gas analyses on drums of transuranic (TRU) waste destined for the Waste Isolation Pilot Plant (WIPP) facility in New Mexico. These analyses are necessary to satisfy WIPP waste acceptance criteria and will be necessary for many years to come as thousands of drums currently stored at the RWMC are shipped to WIPP as part of the privatized Advanced Mixed Waste Treatment Facility. INTEC high-level, treated wastes may require similar headspace analysis if the waste is grouted as a final waste form, as expected. Transportation issues associated with movement of high-level waste, coupled with the fact that CFA laboratories do not have the capability to analyze high-level waste, will require that these analyses be done at INTEC. Relocating and combining this organic analysis capability from CFA to the ICLC at INTEC would make the best use of organic analysis expertise and minimize equipment needs (Figure 8). The *INEEL Infrastructure Long-Range Plan*[1] categorizes CF-625 as being in fair condition. The ICLC will provide office space for 12 personnel and four laboratory modules for the headspace gas analysis operations.

CFA Long Range Plan

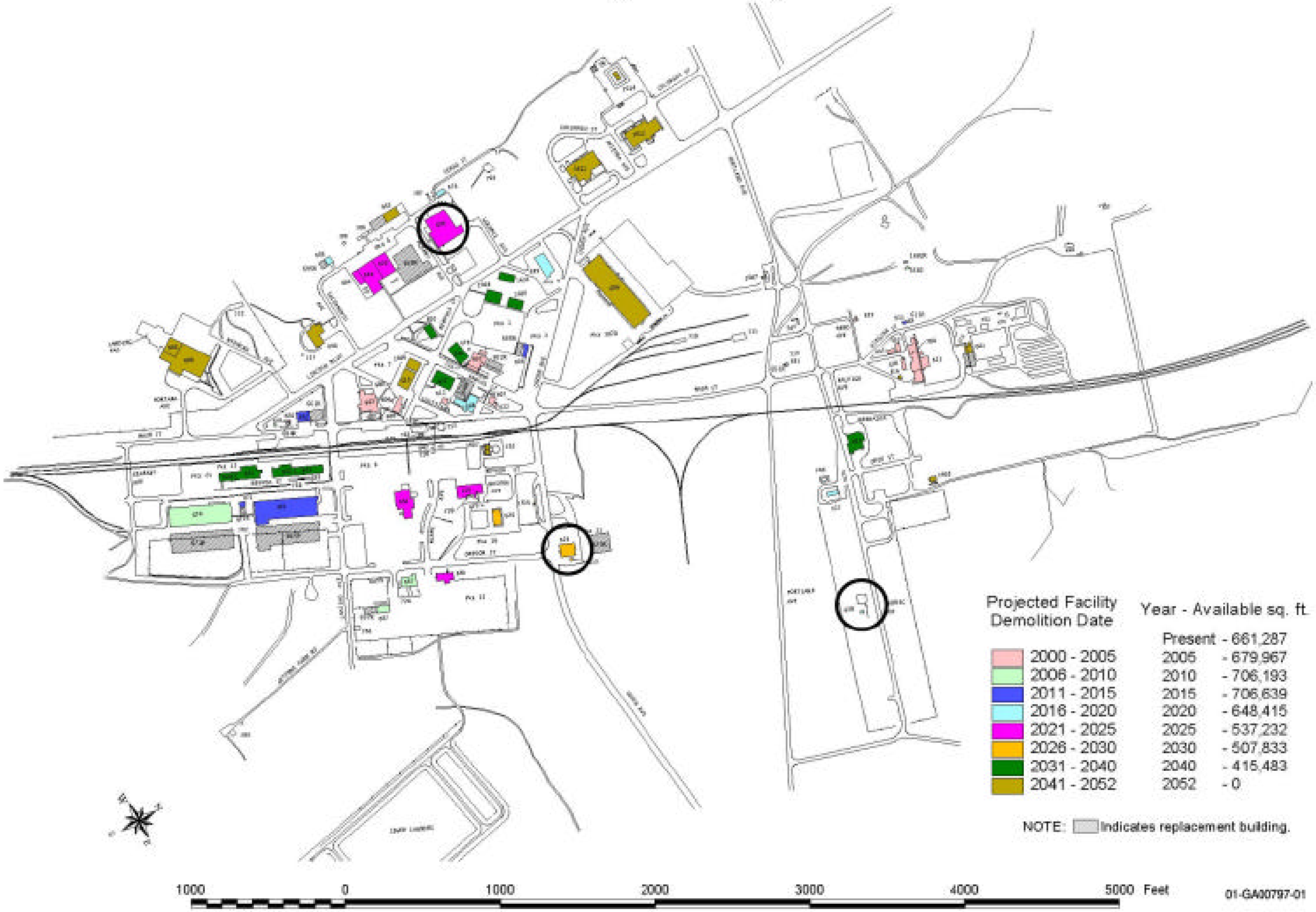


Figure 8. Relocating organic analysis capabilities from CF-625 to the ICLC will exploit INTEC’s analysis expertise and minimize equipment.

CF-625 is also used to conduct bioassay operations for personnel safety and radiological control purposes. Bioassay operations use six of the 16 small laboratories in CF-625. The ICLC could provide space for three personnel and one laboratory module for bioassay operations; however, relocation of the bioassay program to a leased laboratory in Idaho Falls or to another facility in a low background area will be evaluated during the conceptual design phase. CF-625 was constructed as a modular facility and will likely be relocated where it can be used to its greatest benefit.

CF-688/689: The Stoller Corporation, a DOE subcontractor, operates one laboratory in CF-689 for sample preparation of environmental media, including air, water, food products (milk, lettuce), and animals (roadkill, ducks). Sample preparation includes cutting, grinding, drying, and weighing activities. The current space is adequate, with the fume hood being used to suppress odor during organ grinding. Periodically (generally in the fall), a warm laboratory is needed to prepare duck samples from the TRA warm waste ponds. Support space required with the laboratory includes general storage, lockable storage, and two offices for part-time use.

Space for environmental sample preparation is also currently located in CF-688 and -689. This space is run by the Sitewide Environmental Monitoring organization within Bechtel BWXT Idaho, LLC (BBWI) and is generally occupied full time. One laboratory-type space is required for sample preservation activities (requiring the use of a hood and a sink for decontamination/cleaning operations). Storage space is required for sampling supplies, bottles, compositors, chemicals, an ice machine, and a refrigerator. Separate spaces are required for weighing filters and freeze-drying soil samples. These spaces are adequate to meet current needs but are inconveniently located away from any other laboratory space. Thus, opportunities for consolidation are evident. Relocation of these functions to Idaho Falls will be evaluated during the conceptual design phase. Higher-than-normal radiation backgrounds at INTEC prevent these functions from being moved there.

CF-690: The programs within the CF-690 Radiological and Environmental Sciences Laboratory (RESL) are managed to provide radiological and environmental support to the Department of Energy Idaho Operations Office (DOE-ID), DOE Headquarters, NRC, and INEEL. The RESL is a unique DOE asset (Figure 9). RESL activities are geared toward surveillance, oversight, and standardization, including preparation of analytical standards. These activities help DOE and NRC ensure that their contractors and licensees are capable of correctly performing the complex measurements required by health and safety programs in today's nuclear facilities. RESL was originally designed and constructed as a health service laboratory over 40 years ago. While some upgrades have been performed on the facilities through the years, several deficiencies still remain. These deficiencies include an inadequate ventilation system for a facility handling hazardous material, lack of proper space for chemists/scientists (who must consequently use laboratories for offices), corroding and deteriorating chemical fume hoods, and antiquated arrangements to accommodate current and future work activities.

Figure 9. A new facility is needed to house RESL, a unique DOE asset.

The predetermined facility layout; inadequate space, design, process flow, structure, and age; and outdated mechanical, electrical, and communications systems of the current building pose several operational limitations and inherent safety and code deficiencies. A study conducted in 1993 concluded that the age and deteriorated condition of the building made future additions and modifications cost-prohibitive and recommended construction of a new facility to provide one that is safe, functional, and accredited. The ICLC will provide replacement office space for 40 personnel and 25 laboratory modules. Operations such as alpha spectrometry, gamma spectroscopy, radiochemistry, liquid scintillation counting, and standards preparation will be provided. A special whole body and lung counting cave will also be required. Relocation of these functions to Idaho Falls will be evaluated during the conceptual design phase.

A study conducted in 1993 concluded that the age and deteriorated condition of the building [i.e., CF-690] made future additions and modifications cost-prohibitive and recommended construction of a new facility to provide one that is safe, functional, and accredited.

CF-690 (Dosimetry): BBWI operates this portion of the CF-690 RESL. It is used to process personnel radiation dosimeters, maintain the radiation exposure records for the INEEL, and perform whole body counts to detect the internal deposition of radioisotopes.

Dosimetry operations support BBWI; Argonne National Laboratory-West (ANL-W); DOE-ID; the Naval Reactors Facility; British Nuclear Fuels Limited (BNFL), when operational; and DOE in Grand Junction, Colorado, and West Valley, New York. Approximately 70,000 dosimeters are processed annually through this space. Dosimetry operations in CF-690 are impacted several times a year (5 to 10 times) by failing HVAC systems. In several dosimetry operations, for example, temperatures must be maintained no higher than 78ºF, with a minimum relative humidity of 20%.

The dosimetry operations are closely aligned with the bioassay laboratory in CF-625. Daily support for irradiation of personnel dosimetry badges will be obtained from the new Health Physics Instrumentation Laboratory under construction at CFA. The ICLC will include office space for eight personnel, with a 2,500-ft^2 counting bullpen area for five others. A special whole body/lung counting cave will also be provided. The requirements for low radiation background and separation from potential accident locations prevent the dosimetry operations from moving to INTEC. Dosimetry already processes approximately 250 false positives a month even with the low background at CFA. Leaving dosimetry in CF-690, relocating the functions to the CFA medical facility, or making dosimetry part of the leased laboratory facility in Idaho Falls will all be evaluated as part of the conceptual design phase.

CF-638: The irradiation facility for RESL is currently located in CF-638. This building was originally designed as an earth-covered structure to store ammunition used in testing naval guns during World War II and was not specifically designed to meet RESL’s needs. This arrangement has caused operational and safety deficiencies. Over the years, the facility has been modified to accommodate its many occupants, resulting in laboratories that are too small, are poorly laid out, and contribute to radiation exposure problems during the irradiation process. The facility is completely devoid of any water for fire protection, personnel use (for example, for toilets), or experiment requirements. It has only one means of access/egress with a long dead end corridor. Additionally, CF-638 is located about one mile from RESL, so access and labor inefficiencies are compounded. The ICLC will provide space for simultaneous calibrations using beta, Am-241, C_0^{-60}, x-ray and Cs-137. One office space and laboratory modules in the ICLC will address these needs (see Figure 10). Relocation of these functions to Idaho Falls will be evaluated during the conceptual design phase.

Figure 10. CF-638 is a World War II era building with numerous operational and safety deficiencies.

1.5 Test Reactor Area Needs–General

TRA was created in the early 1950s to provide facilities for nuclear materials testing programs. Because of its unique programmatic mission, TRA's Advanced Test Reactor (ATR) and its support infrastructure will continue to operate indefinitely. The radiochemistry laboratories are housed in TRA-604 and -661 (Figure 11), and the major functions of these laboratories will need to be maintained throughout the life of the ATR. Redundant chemistry and physics functions supporting radiochemistry preparation and counting, environmental surveillance and monitoring, and groundwater and air sampling from TRA-604 and -661 are currently being considered for consolidation into the new ICLC. The ICLC would provide office space for five personnel and three laboratory modules to accommodate TRA-604 and -661 radiochemistry functions. Relocation of environmental monitoring and sampling functions to Idaho Falls will be evaluated during the conceptual design phase, since low-level background requirements prevent these functions from being located at INTEC.

Space within the TRA-666 and -666A tritium laboratory houses the fusion safety program for the INEEL. The laboratory contains tritium and other radionuclides. Tritium/chemistry research is conducted on molten salts in this laboratory. Tritium plasma experiments and chemical reactivity measurements are also conducted. These functions are proposed to be relocated to INTEC as part of the ICLC, and space for 10 personnel involved in these functions would be provided.

Figure 11. Radiochemistry laboratories currently housed in TRA-604 and -661 support ATR, which will operate indefinitely.

One additional laboratory module in the ICLC will be provided to support ongoing Generation IV reactor research, and another module will be provided for experiment assembly. Space for 10 personnel for this research will also be provided.

The need to relocate these functions to the ICLC will be finalized during conceptual design following further evaluation and discussion with affected TRA organizations.

1.6 Test Area North Needs

TAN was originally established and developed in 1954 to support the Aircraft Nuclear Propulsion Program, whose purpose was to test the concept of, and build, a nuclear-powered airplane. The program ended in 1961, but over the years, TAN has expanded into four test areas that have hosted a variety of nuclear and nonnuclear research and production activities.

The ICLC will provide approximately 800 ft^2 to conduct tests currently performed at TAN-604 on radioactive materials at high temperatures (Figure 12). Additional space will be provided in the ICLC for activities that include test component fabrication, component preparation, and nonradioactive testing of components. Support space for machine shop needs will be evaluated for consolidation with the CPP-637/620 machine shop going into the ICLC. The ICLC will provide space for five personnel who currently perform the TAN activities listed above.

Figure 12. The ICLC will provide space for functions performed in TAN-604, which is scheduled for closure in 2006.

Tests/experiments conducted in these new laboratories will leverage existing INEEL nuclear technology research capabilities to design, fabricate, and test unique components capable of withstanding harsh high-temperature environments that are often found in nuclear reactors. Because TAN-604 is currently scheduled for closure in 2006, space in the ICLC is needed desperately. Since there is a high risk of contamination where testing is performed, these functions will not be considered for relocation to Idaho Falls.

The INEEL's Subsurface Science Initiative (SSI) is designed to establish laboratories dedicated to subsurface science research that will lead to a better technical basis to deal with the contamination at DOE sites.

1.7 Other Needs–Subsurface Geosciences

Weapons production and energy research activities, along with associated waste storage and disposal, have resulted in the contamination of an estimated 765,000,000 m^3 of subsurface media across the DOE complex. Final cleanup, disposition, and stewardship of these sites will be the focus of DOE's environmental management programs for several decades and will include engineered site remediation, monitored natural attenuation, stabilization, and in situ containment. Many of the subsurface contamination problems involve difficult-to-treat radioactive and mixed-waste vadose zone and groundwater plumes that are unique to DOE and for which no effective treatments are known. The key to developing these new treatments is enhanced understanding of the physical, geochemical, and microbial processes occurring underground.

The INEEL's Subsurface Science Initiative (SSI) is designed to establish laboratories dedicated to subsurface science research that will lead to a better technical basis to deal with the contamination at DOE sites. To conduct research that will apply to DOE's mission for environmental management, experiments must be performed with a variety of hazardous or radioactive materials. One of the proposed new laboratories, the Subsurface Geosciences Laboratory (SGL), will be built in Idaho Falls and is not part of the ICLC project. The SGL will support research with hazardous and radioactive substances on a scope typical of universities with active research programs in geosciences or environmental engineering for remediation, such as the universities in the Intermountain Northwest Research Alliance.

The SSI, however, will require laboratory space within the ICLC that will be used to handle hazardous or radioactive material in amounts, forms, or experimental conditions outside the realm of typical university research due to the unavailability of suitable safety systems and work-control procedures. This laboratory space will be called the SSI-High Level Laboratory (SSI-HiLL). it will be an integral part of the ICLC and will be used for the limited number of testing and experimental programs that are incompatible with the SGL. The SSI-HiLL will also provide SSI researchers with a unique capability for handling high levels of radionuclides that may be introduced into test specimens or for handling actual samples of retrieved radioactive or mixed waste. The SSI-HiLL will open research opportunities that are not possible in standard laboratory settings.

The SSI-HiLL will require space for a TRU laboratory that will be used in experiments to characterize processes influencing the movement of TRU and other actinide elements through variable saturated heterogeneous porous media. This laboratory will evaluate leachability of TRU/actinide elements contained in samples from waste disposal sites, characterize reactive biogeochemical transport processes for TRU/actinide elements, study specimens loaded with TRU radionuclides or other actinides, and provide microbial isolation and culture capability.

Additional space will be required in the ICLC for a high-gamma laboratory. This laboratory will be used to research multiphase fluid flow requiring the use of relatively high levels of gamma-emitting radionuclides. Typical specimens may include clean media (soil or rock) spiked with tracers such as Na-22 or Sr-85. Research will also be conducted on the spatial distribution of gamma-emitting radionuclides in samples with high-activity concentrations (for example, cores from beneath waste or tanks).

The other major laboratory function to be provided in the ICLC for the SSI-HiLL is the geocentrifuge laboratory. This laboratory will conduct accelerated mass transport experiments using radionuclides or large amounts of chemical tracers. A 1- to 2-m radius centrifuge will be procured and installed in this laboratory. This laboratory module will be separated from the core ICLC laboratories because of the large vibrations caused by the geocentrifuge.

Spaces provided in the ICLC for laboratory support for electronics, machine shop, and chemical and radioactive material storage will be shared with other similar ICLC functions. Offices and administration support will be required for 12 researchers and three support personnel. Five laboratory modules will be provided.

1.8 Support/Miscellaneous Needs

Miscellaneous support spaces to be shared by the various functions within the ICLC will include a glass shop (relocated from CPP-637), a machine shop (relocated from CPP-637), a small technical library (relocated from CPP-637), locker rooms/showers from several facilities, conference rooms, break rooms, and chemical storage and miscellaneous storage areas consolidated from several facilities.

1.9 Alternatives Evaluation

A number of alternatives have been evaluated to determine the best value to the government for upgrading or replacing aging INEEL laboratory facilities. The alternatives are discussed below.

1.9.1 Continue Status Quo – Do Nothing

As detailed previously, 80% of the laboratories being consolidated and relocated to the ICLC are generally in poor condition. All thirteen facilities need major HVAC system repairs/replacements, mechanical piping upgrades, hood replacements, and electrical upgrades. CF-638 does not meet life safety codes for egress. OSHA deficiencies for panel clearances are numerous. Personnel assigned to these facilities cannot control the quality of their experiments and data, and chemical hoods can only be opened a few inches to maintain negative pressure requirements, thus giving the chemists insufficient space to actually use anything inside the hood. Some of the facilities need new roofs. Others have piping insulation and floor tile that contain asbestos. And all of the facilities contribute to high maintenance and operation costs ($6.2M annually).

Facility deficiencies have led to safety problems….

Facility deficiencies have led to safety problems, including inadequate ventilation for facilities used to handle hazardous materials, lack of proper office space for chemists who must therefore utilize laboratories for offices, lack of adequate flammable materials storage, corroding and deteriorating chemical fume hoods, and antiquated laboratory arrangements to accommodate current work activities. Several of the laboratories are scheduled for demolition about the time operation of the ICLC is to start. If the laboratories are not replaced, but are instead allowed to deteriorate until they reach the end of their mission, the INEEL will have very little laboratory capability to support any mission.

Only planned maintenance, unplanned maintenance, and minor remodeling activities would occur over the remaining life cycle of the facilities being replaced by the ICLC. Discounted life-cycle costs of this alternative at $312M. If the Subsurface Geosciences Laboratory is not built in Idaho Falls, the site portion would be dropped from the ICLC, which would save approximately $6M.

1.9.2 Replace Parts of Existing Laboratories

This alternative would replace only the worst parts of each facility or would replace the facilities one at a time. Closing part of a facility to upgrade it is generally economically unfeasible. For instance, if the HVAC system for a particular laboratory requires replacement, the HVAC system for the entire system must be taken off line and replaced. That affects all operations in the building and, in some cases, can affect adjacent facilities where air is moved through several facilities (for example, CPP-602 and -630). Operators and chemists would have to be relocated to other equivalent facilities, which are currently unavailable, while the repairs are being made.

Another way to accomplish this alternative would be to replace existing mechanical and electrical systems with stand-alone systems for each laboratory. But this, too, would be impractical, since the installation of multiple systems would require additional electrical capacity, requiring additional energy and placing additional loads on roofs, many of which are already failing and are not designed for additional loads. Additional systems would also require additional preventive and corrective maintenance. During the construction downtime, additional laboratory capacity would have to be made available (possibly by constructing a smaller generic-use turnaround laboratory facility) to relocate the affected experiments to one facility and then back again to the upgraded facility. Overall, the cost of operating and maintaining such facilities would increase rather than decrease, leading to an increase in the infrastructure funding gap. This would be a continual funding issue, since nearly all the laboratories would have to be upgraded. The infrastructure budget would not support such an effort.

A final way to accomplish this alternative is to replace the needed facilities individually based on priority of need (CPP-602, -630, -637, and CF-690) and provide minor upgrades for other facilities not scheduled for shutdown until some time in the future (CF-612, -625, -689). For instance, a new stand-alone line item construction project could be developed to replace RESL ($30 million), or a new laboratory to replace CPP-602 ($26 million), or a series of general plant projects to upgrade other laboratory facilities. But, this would be time consuming, inefficient, and costly. Most of the facilities would have to continue to operate past their scheduled shutdown dates. Capital cost of this alternative totals $50 million. This includes $16M in mechanical and electrical equipment, $5M in HVAC upgrades, $3M in roof replacements, and the replacement of CF-690, RESL ($26M). Life-cycle costs are $263M.

1.9.3 Subcontract Analysis Work Out

This alternative would subcontract the majority of all analyses outside of the INEEL to other commercial entities. Some analyses are subcontracted today when cost efficiencies dictate or facility workarounds (caused by deteriorating laboratories) cause unacceptable delays to analyses customers. Existing laboratory facilities would continue to operate until safety issues essentially close them down or they are no longer functional. This would eliminate all but a few areas for sample preparation. An ongoing need is the timely support of daily operations. If analyses were subcontracted to commercial entities, the INEEL would lose control over the cost and schedule of analyses. The ability to respond to immediate needs or high-priority sample requests would be lost. This would, in turn, lead to a lack of control over processes (for example, the High-Level Liquid Waste Evaporator and Process Equipment Waste Evaporator) and would subject the DOE to fines for missing enforceable milestones.

The INEEL also possesses a number of one-of-a-kind analyses (including high-radioactivity, quick-turnaround, and specialty analyses) that are currently unavailable in the commercial sector. Under this alternative, analysis work would ultimately have to cease, and the R&D missions and work for others would be lost. The INEEL would be at the mercy of the commercial laboratories, their timeframes, and the costs they could demand for analyses. Additionally, the scientists developing and performing these analyses would be displaced, since their skills would no longer be required. A significant portion of the knowledge base of the INEEL would be lost, and the mission could not be completed for DOE. After a period of time, this would result in a national laboratory with few functional laboratories.

1.9.4 Construct the ICLC as Site and Town Facilities

This is the preferred alternative for the ICLC. It would construct the ICLC as a new $87M, 150,000 square foot facility at INTEC, and a new 65,000 square foot leased facility in Idaho Falls. High-level laboratory functions would be consolidated at INTEC and low-level laboratory functions in Idaho Falls. This segregation of high and low-level functions, consolidation of like functions, and relocation of the low-level laboratory functions from the site to town provides the most efficient, cost effective (lowest life cycle costs) solution of all full project mission alternatives evaluated. Eight deteriorating laboratory facilities totaling more than 195,000 square feet would be vacated and annual maintenance savings of $4.0M would be realized. This alternative would address five key institutional plan initiatives and provide state of the art laboratory facilities to attract and retain world class scientists and chemists. Relocation of the low-level laboratory functions into Idaho Falls would also allow improved opportunities for scientific and R & D collaboration among other INEEL and INRA university personnel.

Capital funding for construction would be less than that of one large greenfield facility, or of two separate site facilities. With one facility sited in Idaho Falls, transportation cost savings for personnel and data to and from the site will also be realized as evidenced by the recent BBWI initiative to move site personnel to town. This alternative would also make the best use of available capital dollars by having a private sector firm design, build, and lease the new laboratory facility back to the contractor. This could allow new facilities to be brought on line quicker than the normal progression through the line-item-construction and critical-decision process.

Factors used in determining if a laboratory function must remain at the site or could be relocated to Idaho Falls included:

a. The facility/function classification as a nuclear/nonnuclear facility/function
b. The need for access to the site population/services and the frequency of that need
c. Integration of the process with other activities
d. Quick turnaround times or co-location requirements
e. High-risk probability of contamination of the facility
f. Requirements to monitor for radioactive air emissions
g. Radiological facility designation
h. Amount of explosives present
i. Chemical inventories with mandated emergency plans
j. Transportation efficiencies
k. Required emergency response time.

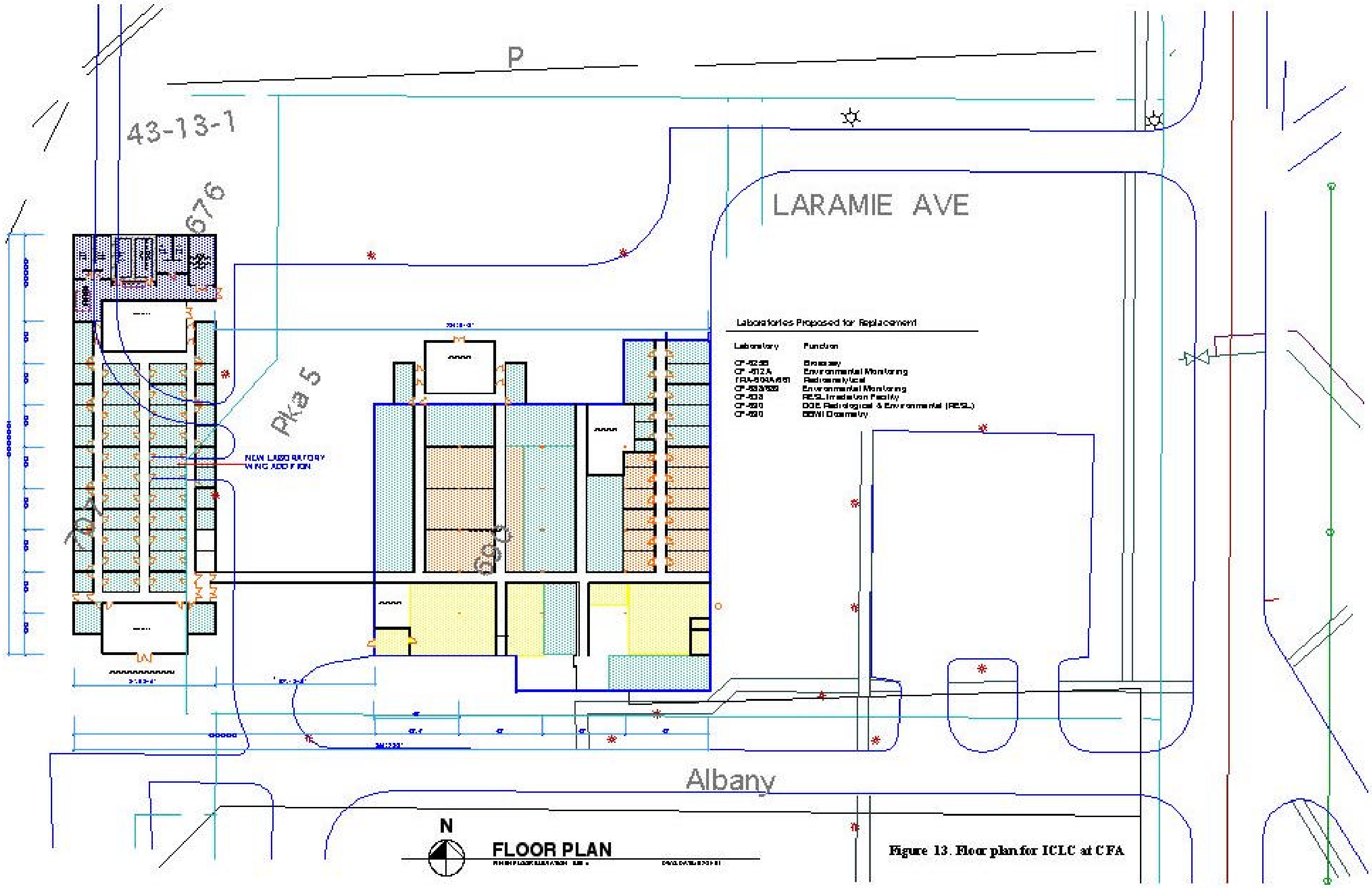


Figure 13. Floor plan for ICLC at CFA.

Having separate facilities at the site and in town facilitates a higher degree of tailoring that can be provided. Each space can be individually designed to support a specific function, and the facilities can be sited in the most convenient locations.

Opportunities for consolidation and elimination of redundant functions cannot be maximized with this alternative. Each of the facilities would require its own support spaces (conference rooms, chemical storage areas, shipping and receiving areas, restrooms, and mechanical/electrical spaces). In general, construction of two small support spaces would require about 10% more space than construction of one large support space.

This alternative offers the lowest capital outlay ($87M), while providing the INEEL with a full-function laboratory complex designed to meet the current laboratory missions and those of the 21st century.

1.9.5 Construct the ICLC as Two New Site Facilities

This alternative would result in construction of the ICLC as a new 160,000 square foot facility at INTEC and a new 65,000 square foot facility (or a refurbished facility) at CFA (Figure 13). This would be the recommended solution should DOE not allow low-level radioactive work to take place in Idaho Falls. Relocation of ICLC functions to Idaho Falls would not be included in this alternative.

This alternative would result in construction of the ICLC as a new facility at INTEC and a new facility (or a refurbished facility) at CFA.

This alternative is dictated by the need to separate high- and low-level operations. Opportunities for consolidation are improved from a three facility scenario. But each facility would still have similar support spaces (conference rooms, chemical storage areas, shipping and receiving areas, restrooms, break rooms, and mechanical and electrical rooms). Costs for construction would be increased over that of a single facility, since more exterior walls, roofing, utilities, etc., would be required. This would also lead to a less-than-optimum expenditure for operation and maintenance costs (an increase in energy consumption over a single building configuration).

On the positive side, this alternative would provide a separation of the high-level research and development laboratories from the low-level support laboratories associated with environmental and regulatory monitoring. Basically, existing CFA facilities and nonnuclear TRA facilities would be consolidated into a new facility at CFA, while INTEC facilities, nuclear-related TRA functions, and CFA functions that are similar to those at INTEC would be consolidated into a new INTEC facility. Facilities with similar needs would be sited together, but major themes would be sited apart. For example, the dosimetry, bioassay, and environmental laboratories could be located in lower background areas at CFA to maintain the necessary sensitivity for specific measurements.

The facilities could be tailored to their specific functions and located adjacent to the facilities they support at CFA. This alternative still accomplishes consolidation of laboratory functions but would cost more than the single facility configuration alternative in design, construction, and life-cycle costing.

Capital costs of this alternative are $128 million. Life-cycle costs for this alternative are $269M.

1.9.6 Adaptive Reuse of Fuel Processing Facility

An alternative extensively investigated as part of this pre-conceptual process was the adaptive reuse of the existing, but unused, 170,000-ft^2 Fuel Processing Facility, CPP-691.

An alternative extensively investigated as part of this preconceptual process was the adaptive reuse of the existing, but unused, 170,000-ft^2 Fuel Processing Facility (FPF), CPP-691. A study conducted by HDR Architects concluded that by modifying FPF, approximately 120,000 ft^2 of usable space could be provided for offices and laboratories from CPP-602 and -630 and CF-612 and -625, subsurface science needs, and some support functions. A separate facility would also have to be constructed to provide full ICLC functionality if FPF were to be used, because sufficient space to replace all the laboratories and support functions required in the ICLC would not be possible. On May 17, 2001, however, the ICLC team was instructed that for reasons of national energy policy and the potential future use of FPF for fuel reprocessing, the ICLC Project was no longer to consider adaptive reuse of FPF as part of a viable alternative.

Capital costs for this partial solution (only 26 laboratory modules and 170 offices were provided) was $38 million, and this estimate did not include Davis Bacon wage rates or any other INEEL adders at the direction of BBWI Management.

1.9.7 Construct the ICLC as One New Greenfield Facility at INTEC

This alternative provides the best option from a consolidation standpoint. Since the facility would be designed from scratch, each space could be tailored to the specific function it houses (Figure 14). Maximum aggregation of laboratory space into unit areas could be best practiced with this alternative. Laboratory and support functions would be consolidated and housed adjacent to similar functions to make effective use of the space, and redundancy of support functions would be eliminated.

In addition, INEEL competes with other research centers in the government and in the private sector for quality scientific staff. Construction of the ICLC outside the INTEC boundaries would provide the best opportunity to create a safe, efficient, high-quality research center to recruit and retain scientists at the INEEL. A major drawback to this alternative is the risk that relocation of dosimetry/bioassay operations to INTEC would render them unusable if there were any type of radiological incident at INTEC.

Construction costs for extra shielding would be required to segregate functions requiring low-level backgrounds from those creating higher-level backgrounds. This combination of low-level/high-level functions could cause operational difficulties that have been experienced before when low-level activities were located at INTEC.

Capital costs for this 220,000 s.f. alternative would approach the $140M range. Life cycle costs of this alternative are $270M.

Table 1. Consolidated Laboratory Complex Project Alternatives

Primary Alternatives	TPC/LCC	Advantages	Disadvantages	Remarks
1. Do Nothing	TPC = $0 LCC = $ 312M	Least capital investment	Highest life-cycle cost. Jeopardizes critical missions by failing to resolve pressing problems. Existing facilities will continue to require high maintenance and capital upgrades	Laboratory analyses required through at least 2035 Second lowest K-T alternative score
2. Replace individual systems and portions of existing facilities	TPC = $80M LCC = $289M	Reduces maintenance costs. Fixes major problem areas. Low construction cost. Allows completion of majority of missions	Approaches the cost of a new facility and would disrupt ongoing lab operations. Longest construction schedule. Doesn't address all lab deficiencies. Facilities still inefficient, old	Lowest K-T alternative score
3. Build new lab facility at INTEC, don't upgrade RESL	TPC = $98M LCC = $215M	Replaces most needed laboratories. Consolidates high-level operations into a single facility	Doesn't address all deficiencies (no low-level laboratories will be upgraded with this option, no consolidation of low-level functions). Upgrade to RESL not included	Middle K-T alternative score.
4. Build new lab facility at INTEC, lease new lab space in Idaho Falls*	TPC = $100M LCC = $242M	Most cost-effective and functional solution. Favorable life-cycle cost savings. Includes space for RESL work. Vacates deteriorating labs. Allows consolidation of low-level functions	Requires private-sector firm to accept lease renewal risk	Highest K-T alternative score – 17% higher than second-best
5. Build new lab facility at INTEC, remodel RESL	TPC = $120M LCC = $269M	Maintains all lab functions at the site. Eliminates deficiencies for both high- and low-level laboratories. Allows mission needs to be completed	Most expensive scenario. Doesn't fit current planning philosophy. Doesn't include cost-effective relocation of low-level functions to town	Second highest K-T alternative score

* Preferred alternative
TPC = Total project cost
LCC = Total discounted life-cycle cost
K-T = Kepner Tregoe

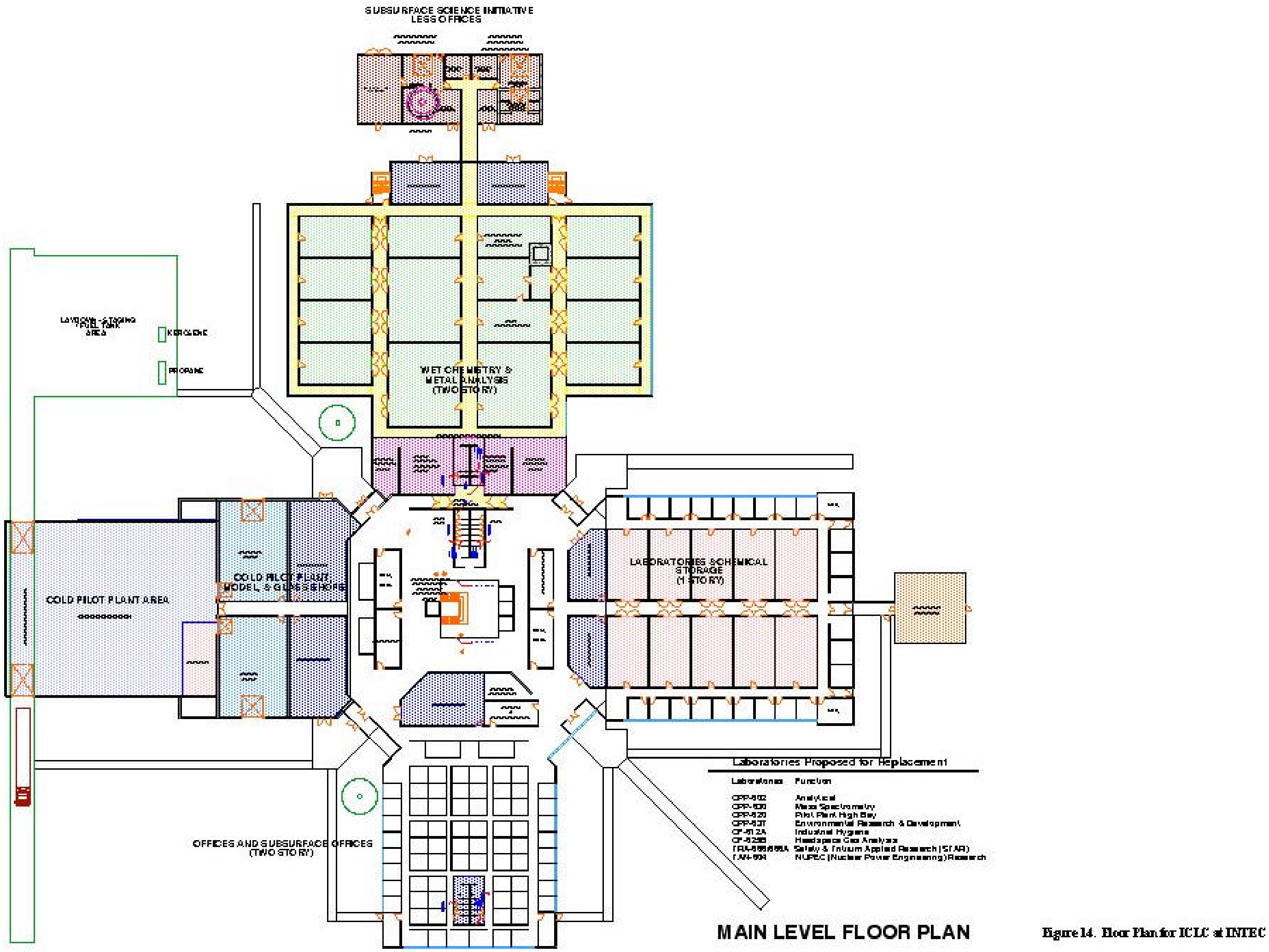


Figure 14. Floor plan for ICLC at INTEC.

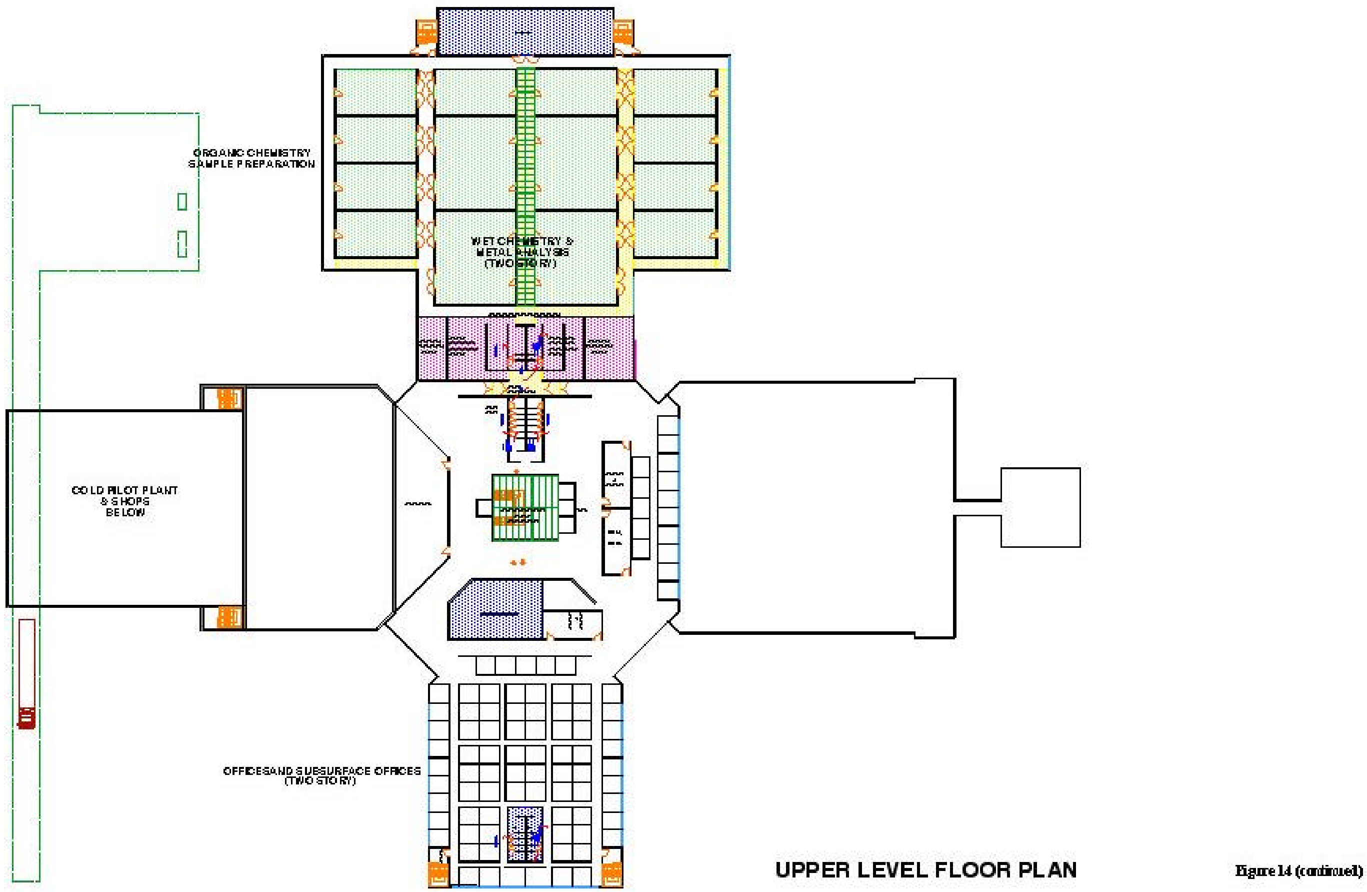


Figure 14 (continued)

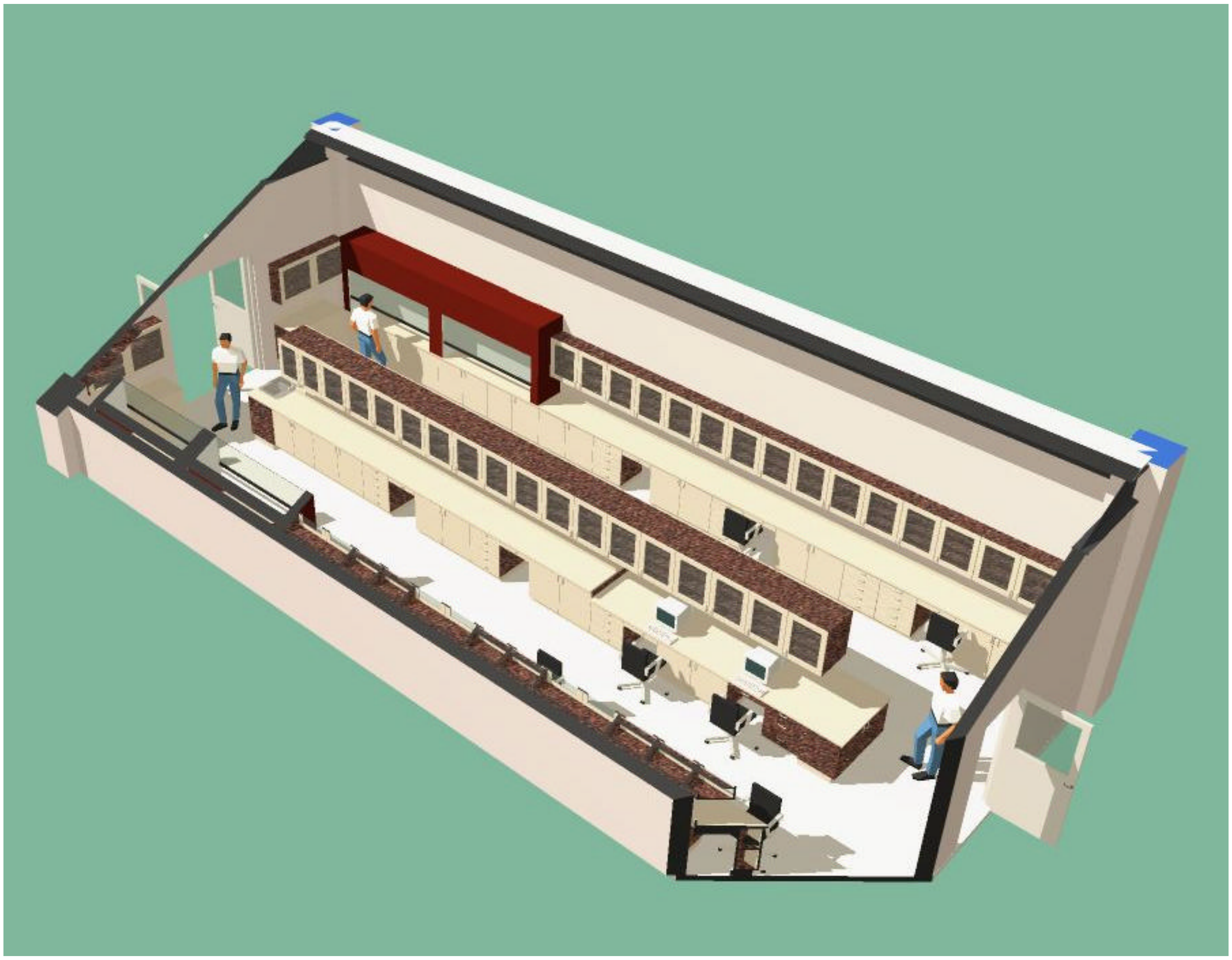


Figure 15. Typical Analytical Laboratory Module.

1.9.8 Facility Alternatives

This section evaluates the use of existing facilities for their adequacy to house future missions for waste treatment technology development processes.

1.9.8.1 Existing INEEL Facilities

…review of these existing facilities shows that they no longer meet the identified systems requirements, which increases the need for the ICLC.

INTEC Facilities: Calcination and acidic solution separations technologies used at INTEC for the treatment of its high-level liquid radioactive wastes were developed at INTEC. As a result, it was expected that INTEC had facilities that could support development of calcine treatment technology. However, the following review of these existing facilities shows that they no longer meet the identified systems requirements, which increases the need for the ICLC.

- CPP-620 (the Chemical Engineering Laboratory High Bay) is a 4,418-ft^2, one-story facility built in 1968 to house calciner pilot plants and laboratories. This facility has extremely limited space for radioactive chemistry and would need to be supplemented with additional facilities. This facility lacks a sufficient highbay, utility systems, and an overall layout area to support scale-up testing or treatment technology validation. Because of its overall age and condition, CPP-620 is slated for demolition by 2010. Approximately 10,000 square feet is required to effectively replace this function to provide adequate future support for INEEL.

- CPP-637 (Process Improvement Facility) is an antiquated 32,500-ft^2 facility built in 1959. Programmed for existing research needs, no space is available to perform process validation using actual radioactive wastes. Numerous safety issues (electrical, life safety, etc.) also exist in this building (Figure 16). Among other problems, the existing waste drain lines do not meet current RCRA requirements, and the ventilation and climate control systems are inadequate. More important, this facility is slated for demolition by 2010 because of its age, construction technique, and resulting physical condition. As it is, major rehabilitation ($4.6M HVAC/electrical upgrades) would be required to maintain the facility until a replacement facility is acquired. Furthermore, other rehabilitation activities would be required to make this facility environmentally compliant for the type of activities envisioned. Given these inadequacies, rehabilitation would be costly, and maintaining operations of the facility during facility rehabilitation would be even more expensive. For these reasons, the INTEC facility most likely to be used for development of calcine treatment technology is deemed unavailable.

- CPP-684 (RAL) is a 12,000-ft^2 facility built in 1985 to house laboratories and hot cells to support the analytical needs of the Fluorinel Dissolution Process Project. Since dissolution was terminated in 1992, portions of the facility are used to support bench-scale, radioactive testing; however, initial investigation suggests that it would be grossly insufficient for the anticipated work activities because of the throughput. CPP-684 was never designed to support technology development activities at the required scale-up level (just bench-top operations). Also, CPP-684 is still committed to other production analytical support missions.

Figure 16. Numerous safety issues, exist at CPP-637.

- CPP-1634 (Technology Development Facility) is a 3,157-ft^2, one-story facility built in 1993. This facility is planned to support site closure as a decontamination facility until 2043. Although this facility could be programmed to support the calcine technology development effort, CPP-1643 does not have sufficient head room, crane capacity, off-gas handling ability, utilities, waste disposal facilities, and floor space to support most of the envisioned equipment mockups. The initial analysis finds this facility clearly insufficient to meet the projected requirements.

- CPP-691 (FPF) is the last facility evaluated to meet the identified systems requirements (with facility modifications). The FPF is a 170,000-ft^2 facility that was under construction in 1992 when the fuel-processing mission was discontinued; therefore, construction was never completed. A previous study (Project File No. 015608, April 26, 1993) evaluated the feasibility of converting FPF to a multifunction pilot plant. Because of its original design and specific functionality, the cost to modify this facility would equal or exceed the cost to construct a new facility. Additionally, the modified facility would not provide the same degree of functionality as a facility specifically designed for the required technology development function. As noted previously, FPF has been removed from the list of available facilities by BBWI/DOE management due to its future potential use to reprocess fuel.

Other INEEL Facilities: ANL-W has laboratory facilities to support its needs; however, these facilities have several drawbacks when considering them for INEEL-wide support. First, all ANL-W facilities were designed to handle solid materials, whereas INEEL's HLW Program requires liquid-handling capability within and between laboratories. Second, ANL-W operates in an argon atmosphere, whereas the INEEL program operates in atmospheric air. Third, availability cannot be ensured, since ANL-W programmatic needs must be met first.

ANL-W has laboratory facilities to support its needs; however, these facilities have several drawbacks.

TAN has some capability that was also evaluated. The facilities (especially the hot cell annex) would require extensive renovation to be usable. Infrastructure upgrades would likely be required to accommodate handling of casks used to transport radioactive materials between INTEC and TAN. The TAN facilities include little or no analytical capabilities, sample preparation areas, or analytical hardware, and there are no functional liquid waste-handling systems. There are also several safety, economic, and logistical concerns with transporting radioactive waste to any of the remote sites, raising extreme logistical issues about using any of these facilities for the ongoing process support projected.

1.9.8.2 Non-INEEL Process Improvement/Technology Development Facilities

INEEL personnel visited the Pacific Northwest National Laboratory (PNNL) and the Savannah River Site (SRS) during the preliminary feasibility studies. While the personnel at these sites were helpful and valuable information can be gained by sharing experiences with the other sites, opportunities for use of existing facilities at these other sites for actual testing activities are limited. The PNNL and SRS facilities give first priority to their own onsite programs before performing work for others. Thus, use of such facilities could not be guaranteed for the INEEL program in the timeframe needed. Logistical drawbacks—such as shipping costs, political issues associated with radioactive waste, and acidic waste-handling capabilities and knowledge base—would be even greater for one of these remote sites.

INEEL personnel also visited the Environmental Technologies Laboratory at Clemson University. The Clemson site is a nonnuclear facility and could only be used for nonradioactive work. It would have to be contracted years in advance for sizeable activities with a guarantee that Clemson University would be paid to ensure space for the INEEL program. The space for nonradioactive testing is relatively inexpensive, but any cost savings would probably be outweighed by logistical and transportation costs. Other identified university or industrial facilities would have similar drawbacks, with no particular advantages. Even with these drawbacks, the INEEL is testing these waters with small research activities for the HLW Program.

Consideration was given to separating the nonradiological portions of the ICLC. However, the facility will handle RCRA hazardous chemicals and will have air emissions that will require permitting. Any alternative location would require the infrastructure for handling and disposing of hazardous chemicals and would complicate the air permitting issues. Also, proximity to the planned calcine waste treatment facilities is desired for the previously mentioned ongoing process support. Relocation of non-radiological functions to Idaho Falls will be further evaluated during the conceptual design phase.

2. PRELIMINARY TECHNICAL PERFORMANCE REQUIREMENTS

This section presents the preliminary technical performance requirements for the ICLC. An analysis of the needs of potential laboratory occupants was performed and their requirements collected. The information, grouped by type of space required, will be used to determine the number and types of laboratories and support spaces in the ICLC during conceptual design. The ICLC will not replace facilities in a like-for-like manner, and impacts of the pending reduction in force will be included in the final number of ICLC offices and laboratories.

Laboratory modules will be sized based on the sampling and analysis needs proposed by each function. A standard set of laboratory modules based on a 20- × 40-ft standard module will be developed during conceptual and title designs. The set will include ½ modules, full modules, 1-½ modules, and perhaps one or two other variations. Table 2 shows a conservative approximate gross size of the new ICLC. Actual square footage should be reduced as laboratory functions are consolidated and redundant operations and support facilities are deleted.

2.1 General

General preliminary technical performance requirements for the ICLC are as follows:

- The ICLC will have laboratories capable of analyzing the sample load estimated in "Customer Requirements for INEEL Sample Analysis Services," INEEL/INT-2000-01393, November 2000, with caveats as explained in Engineering Design File 1829, "Analytical Laboratory Requirements."
- The design life of the ICLC will be a minimum of 40 years.
- The major portion of the ICLC will be located in or near INTEC.
- The ICLC will incorporate energy efficient insulating, mechanical, and electrical systems to provide reasonable operational costs.

2.2 Architectural

Though difficult to quantify, the ICLC must architecturally convey its role as the anchoring facility for the INEEL's leadership in analytical laboratory capability, subsurface research, nuclear research, and HLW treatment technology/process development. This world-class facility will enable the DOE to meet its milestones and enhance its reputation for excellent science, facilitate development of collaboration with other R&D efforts, and make the INEEL more attractive to the personnel necessary to perform its science missions. Specific requirements include the following:

This world-class facility will enable the DOE to meet its milestones and enhance its reputation….

- The ICLC will provide common facilities that promote effective technical interaction, integration, and synergism between all organizations involved in developing a solution to a specific technology/process or subsurface problem.

- Use of natural light will be maximized, where practical, throughout the ICLC to lend a more open atmosphere, increase productivity, and conserve energy.

- Visitors will have the opportunity to observe laboratory operations to the maximum extent reasonable without actually entering the laboratories, so that research facilities and capabilities may be explained and demonstrated to visitors without disrupting operations. Laboratories will be provided with a mechanism to black out the windows during sensitive research.

2.2.1 Functional Areas

The following subsections describe the functional areas of the ICLC.

2.2.1.1 Process Development/Mock-Up Area

The Process Development area (currently known as the Cold Pilot Plant in the Environmental Research and Development Laboratory in CPP-637 and -620) will accommodate multiple technology development processes expected to operate as described in Reference 3. The types of processes to be employed in this pilot plant may include dissolution, ion exchange, separations, evaporation, fractionation, denitration, grouting, and vitrification.

- The Process Development area will be a large, modular, open bay to maximize the flexibility of test configurations that flow continuously across the mock-up area and the receiving bay.

- The Process Development area will be an enclosed area of approximately 10,000 ft^2. This portion of the ICLC will be designed to meet Occupancy H2, H3, and F, Type II noncombustible construction, according to the IBC. The super structure will be designed to address a 10-ton overhead bridge crane and all vertical and shear loads.

Table 2. Square footage estimate for the ICLC.

Existing Facility	**Condition**	**Existing ft^2**	**Offices**	**Labs**	**Replacement ft^2 via ICLC**	**Offices**	**Labs**	**Functions**	**Potential to Lease in Idaho Falls**	**Replace at Site**
CPP-602	Poor	47,628	36	27	63,000	36	27	Analytical support for HLW, SNF, all of INEEL		XX
CPP-630	Poor	22,090	18	7	16,000	23	7	Mass spectrometry for HLW, SNF, all of INEEL		XX
CPP-637	Poor	32,400	54	9	30,000	60	10	Pilot and process operations for waste, groundwater, separations, decon, offgas technologies	XX	XX
CPP-620	Poor	4,418	0	2	13,000	0	2	Pilot testing/technology demonstration	XX	XX
Subtotal		106,536	108	45	122,000	119	46			
CF-612	Fair	9,855	4	3	6,000	4	3	Industrial hygiene sample analysis	XX	
CF-625	Fair	7,533	15	12	12,000	18	5	Bioassay, headspace gas analysis, gcms	XX	XX
CF-638	Fair	1,030	0	3	4,000	1	2	Radiation calibration laboratory	XX	
CF-690	Very Poor	32,238	40	25	50,000	40	25	DOE QA and reference laboratory, BBWI dosimetry	XX	
CF-689	Fair	5,000	2	2	4,000	2	2	Environmental monitoring & surveillance	XX	
Subtotal		55,656	61	45	76,000	65	37			
TRA-604A	Poor	5,000	5	8	4,000	2	2	Non ATR radioanalytical analysis in support of sitewide environmental monitoring	XX	
TRA-666	Poor	4,320	10	4	5,000	5	2	Tritium laboratory		XX
TRA-661	Fair	2000	6	1	2,000	2	1	Non ATR radioanalytical analysis in support of sitewide environmental monitoring	XX	
Subtotal		24,524	21	13	11,000	9	5	**Only TRA functions not supporting ATR are being proposed for inclusion in ICLC**		
TAN-604	Fair	12,364	5	5	5,000	1	3	High temperature radioactive materials testing		XX
SSI-HiLL	New	0	0	0	11,000	15	5	New functions		XX
Grand Total		**185,876**	**195**	**108**	**225,000**	**209**	**96**		**65,000**	**160,000**

Note: Check ft^2 = (((offices × 120 ft^2) + (labs * 1,000 ft^2)) *1.30 for circulation) *1.30 for mech/elect/support

- The 10-ton overhead bridge crane will be capable of travel to support the receiving and mock-up areas. The crane will be used to move vessels and equipment into, out of, and throughout the high bay with a clear hook height of 40 ft. Power and controls will be by festoon cable and pendant or radio control. Power requirements are estimated at 10 hp.

- A pair of metal catwalks will be located along the sidewalls to access the pilot test equipment and utility manifolds located at two elevations above the floor. A single process off-gas exhaust duct will encircle the Process Development area and transport all treated process off-gas streams to the stack, where it will be exhausted through a high-efficiency particulate air filter. All standard utilities will encircle the area at the perimeter walls and will be accessed by the catwalks mentioned above.

- A computer local area network will encircle the area, allowing automated data acquisition for all pilot processes as well as remote control and/or monitoring from a central server/control room.

- The center aisle of the area will be dedicated for the circulation of equipment, materials, and personnel.

- A series of shallow grate-covered trenches will laterally cross the floor of the area to permit piping connections between processes on either side of the center aisle without obstructing the working area or impeding movement of materials and equipment with the crane or forklift.

- The mock-up area will be an extension of the Process Development area with access to the shipping/receiving bay. Crane and electro-mechanical manipulator runways (with support structures) will be incorporated into the area.

- The mock-up area will serve as a preparation area for the Process Development area.

2.2.1.2 Laboratories

Each type of laboratory will be built on a modular basis, meaning all laboratories of a type will be repeats of the same basic size with the same basic features. Actual fit-up of individual laboratory configurations will be left until the last reasonable opportunity to allow them to meet the needs of the first tenant when identified. Specific requirements include the following:

- A mix of developmental and analytical laboratories with approximately four to six fume hoods will be provided for each laboratory.

- Countertop space, sinks, drains, bottle racks, laboratory cabinetry, emergency showers/eyewashes, and utility designs will be provided. Low-maintenance, chemical-resistant surfaces and impermeable floors will be provided.

- A net minimum of 800 ft^2 – 1,000 ft^2 will be allocated per laboratory.

- Separate service and pedestrian corridors will be provided to the laboratories, keeping all hoods and higher-hazard operations away from the pedestrian exits.

- A complete laboratory equipment and design study will be conducted with the customer scientists during conceptual design. New laboratory trends, including flexibility, operations, maintenance, enhancements for scientist interaction, and future concepts, will be evaluated.

2.2.1.3 Offices

- This portion of the ICLC will be designed to meet Occupancy B, type II, noncombustible construction in accordance with the IBC.

- Offices will include cubicles and hard-walled offices. The cubicle offices will offer flexibility and will be arranged so that their occupants are the beneficiaries of natural light to enhance researcher productivity.

- The ICLC requires at least 195 offices overall, of which approximately 150 will be hard-walled.

2.2.1.4 Receiving, Lay-Down, Storage, and Support Areas

- This portion of the facility design will meet Occupancy F, Type II noncombustible construction criteria, according to IBC.

- The shipping/receiving lay-down area will provide for the shipping and receiving of materials to the overhead crane bay of the Cold Pilot Plant and mock-up area.

- The shipping and receiving bay will have an overhead, insulated, vertical-lift door capable of maintaining pressure barriers.

2.3 Structural

- With respect to DOE Standard 1020 and natural phenomena hazards (wind, seismic, and flood), the ICLC will be designed to two performance categories: PC-2 for areas handling and treating radioactive and hazardous materials, and PC-1 for the support area. For both categories, seismic design will be in accordance with the procedures and provisions of the UBC using Seismic Zone 2B importance factors of 1 and 1.25 for PC-1 and PC-2, respectively.

- Wind design will use American Society of Civil Engineers Standard 7 criteria with importance factors of 1.0 and 1.07 for PC-1 and PC-2, respectively; a basic wind speed of 70 mph; and an exposure category of "C." For roof loads, designers will consider a minimum snow load of 30 psf and include any additional loading due to drifting, as applicable.

- Design loads for the new ICLC will comply with the DOE-ID Architectural Engineering (A-E) Standards. Consideration will be given to the effects anticipated from equipment loading, including overhead cranes.

- Vibrations that could adversely affect research work will not be transmitted through the facility. A minimum of Type I vibration criteria for laboratory floors will be followed.

2.4 Mechanical

Areas in the project will generally be controlled to the following environmental conditions, as outlined in the DOE-ID A-E standards:

- General offices and laboratories will be heated to 72ºF, storage and shipping areas to 65ºF, and mechanical penthouses to 60ºF.

- General office and laboratory areas will be cooled to 76ºF dry bulb.

- Some equipment and laboratories may require more precise controls of humidity and indoor air quality than the rest of the facility. An example of this might be the Inductively Coupled Plasma Mass Spectrometer Laboratory and the Gas Chromatograph Laboratory, which will each require clean room type atmospheres with humidity held constant between 40 and 70%.

- Individual laboratory temperatures will be capable of adjustment, and the HVAC system will be capable of maintaining the indoor temperature within 2ºF of the setpoint.

- Environmental conditions of each laboratory will be separately monitored from a central control area in the facility and from separate control panels located just outside each laboratory.

- Outside air will be vented into all occupied areas at a minimum rate of 20 ft^3/min per occupant to comply with American Society of Heating, Refrigeration, and Air Conditioning Engineers standards. The laboratories will be heated, cooled, and ventilated with 100% outside air at all times to avoid possible reintroduction of effluents into the air supply distribution system. The flow into and out of the laboratories will be as required by fume hood and auxiliary hood exhaust flow requirements, heating and cooling loads, and differential pressurization requirements.

- Areas that could produce dust particles, odors, fumes, gases, smoke, or radiological contaminants from laboratory processes will be exhausted in a manner that ensures negative pressure with respect to the adjacent internal spaces.

- Potable water and sewer systems will be tied into existing systems. All water and sewer systems will be designed to the latest edition of the Uniform Plumbing Code and DOE-ID Architectural Engineering Standards.

- Compressed air and other applicable laboratory gases will be provided as required for operation of various laboratory and maintenance equipment.

- The fire protection features for the ICLC will be designed in accordance with the requirements of the UBC, National Fire Codes, and the Uniform Fire Code. Based upon the proposed operation of the facility, a mixture of occupancies is expected. Special attention will be paid to hoods (general and perchloric), radioactive materials handling and storage, chemical storage areas, and computer/control applications.

2.5 Electrical

- The electrical distribution system will be tied into existing systems. Three-phase, 480-277-volt power will be used for large loads, motors, and lighting. Receptacles, small loads, and general power will use 208-120-volt distribution.

- Uninterruptible power supplies will be installed when required for special computer systems, special electronic equipment, communications systems, and some life safety systems.

- Lighting will be energy conserving fluorescent, except in specialty areas inside the facility. Fluorescent lighting will not be used outside the facility.

- A lightning protection and grounding system will be provided.

- Communication systems for telephone, data, voice paging, and evacuation alarms will be provided.

- Life safety systems will be fire alarm, evacuation, emergency lighting, radiation alarm, radiation warning light, and room interlock systems.

- The ICLC shall be part of the INEEL Intranet that will provide for security, network management, and overall network applications. No special data security requirements beyond those present in the INEEL Intranet is expected.

2.6 Safety

The many different work functions that the ICLC will support and the large range of chemicals and materials it will contain mean that a single safety category is not applicable for the ICLC. The proposed type of construction using different facility pods composed of (usually) self-contained modules, is also amenable to several safety category evaluations depending on the specific area addressed.

Safety Category — Determination. Facility safety categorization shall follow the requirements of DOE-ID Order 420.D and the guidance in DOE-STD-1027-92 and INEEL MCP-450, “Documenting the Safety Category of Structures, Systems, and Components.” The safety categories that the ICLC may encompass are Safety Class (SC), Safety Significant (SS), Low Safety Consequence (LSC), and Consumer Grade (CG). Most likely, ICLC safety categories will be Safety Significant or lower in risk since some of the laboratories to be replaced are presently classified as Nuclear Hazard Category 2.

The highest threshold hazard category for the ICLC is expected to be non-reactor nuclear facilities hazard category 3. Some pods will be the subject of Occupational /Safety requirements (OSR) and Technical Safety Requirements (TSR) depending on the level of hazards or radionuclides contained within the pod. Specific pod hazard categorization and safety analysis classification assessments will be initiated during conceptual design.

The Integrated Safety Management System (ISMS) process will be tailored for use during construction of the ICLC. Since the ICLC will be constructed outside the formal boundaries of INTEC, the implementation of ISMS will not be as rigorous as if it were constructed inside the INTEC boundary.

2.7 Security

Intellectual property rights of persons will be protected while providing the open viewing capability of the laboratories described in the architectural requirements (see Section 2.2). A form of electronic badge access will likely be required to access each laboratory or group of laboratories in order to restrict access to individual spaces while allowing personnel without security clearances, such as researchers that are foreign nationals, maximum access to appropriate portions of the facility. Computer security will balance the need for data integrity and experiment control against the requirements for remote access by collaborating scientists (including foreign nationals expected to be working with the Subsurface Science Program).

3. SCHEDULE AND MILESTONES

The schedule for the ICLC Project uses a standard process for critical decision (CD) authorization to allow construction to be initiated as early as practical in the project. Table 3 and Figure 17 present the schedule for the project, showing the design, construction, and startup activities and the CD milestones to permit this process to be accomplished. Conceptual design for the project will be performed in fiscal year (FY) 2002 and FY 2003. The expenditure of capital funding for design will begin in FY 2003, with construction starting in FY 2006. Project closeout will occur in FY 2010. Substantial improvement in schedule for portions of the ICLC can likely be realized by utilizing a design/build/leaseback option for the low-level laboratory functions constructed in Idaho Falls.

Table 3. Project milestones and major phases.

Activity	Start	End
CD-0	–	1st Qtr FY 2002
Project Data Sheet PED	–	3rd Qtr FY 2001
Conceptual Design	2nd Qtr FY 2002	2nd Qtr FY 2003
Project Data Sheet Construction	–	3rd Qtr FY 2003
CD-1	–	3rd Qtr FY 2003
Definitive Design	3rd Qtr FY 2003	4th Qtr FY 2005
CD-2	–	3rd Qtr FY 2004
CD-3	–	1st Qtr FY 2006
Construction	2nd Qtr FY 2006	2nd Qtr FY 2008
Operational Readiness Reviews	–	1st Qtr FY 2009
CD-4	–	2nd Qtr FY 2009
Phased Move-in	–	4th Qtr FY 2009
Project Closeout	–	4th Qtr FY 2010

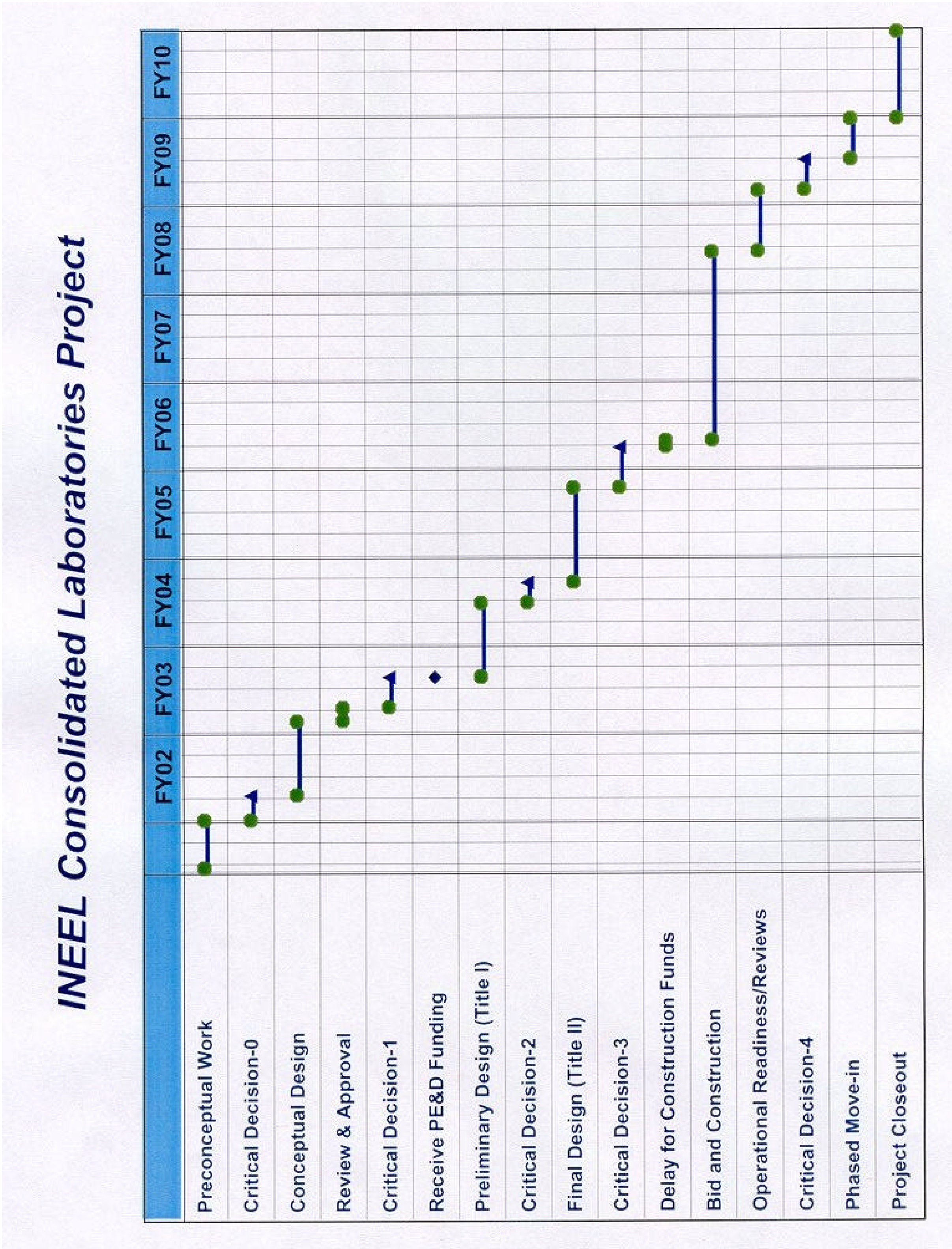


Figure 17. ICLC Project Schedule.

4. TOTAL PROJECT COST

The preconceptual planning cost estimate for the ICLC project is based on a two facility option, that is, a high-level facility at INTEC and a leased low-level facility in Idaho Falls based on the recommended alternative, as explained in Section 1.9 of this document. Table 4 shows the costs for the project broken down by major activity and the type of funding. Table 5 shows the funding by fiscal year. The cost estimate information for the project is contained in Appendix B.

Table 4. Project funding.

Activity	Subtotal $K	Total $K
Total Estimated Cost (TEC)		**$ 80,070**
Design Costs (Preliminary/Final)	$ 7,133	
Construction	57,869	
Construction Management	5,519	
Quality Assurance/Inspection	2,609	
Project Management	6,940	
Other Project Costs		**$ 19,930**
Conceptual Design	$ 1,515	
Project Support	3,690	
Testing/Startup	1,726	
Lease Costs	13,000	
Total Project Cost (TPC)		**$ 100,000**

Table 5. Funding by fiscal year ($K).

	FY-02	FY-03	FY-04	FY-05	FY-06	FY-07	FY-08	FY-09	FY-10	Out-years	Total
TEC	0	1,236	2,739	4,069	21,064	30,823	17,490	1,898	751	0	80,070
OPC	1,192	941	265	442	442	442	2,404	3,026	1,678	9,100	19,930
TPC	1,192	2,177	3,004	4,511	21,506	31,264	19,894	4,924	2,429	9,100	100,000

5. ACQUISITION STRATEGY

The acquisition strategy for the ICLC Project is discussed in detail in separate CD-0 documentation available for review upon request. A brief summary of that information is provided below.

5.1 Critical Decision Authorization

The standard CD process outlined in DOE Order 413.3[4] will be used for design, construction, startup, and CD authorization due to the nature of this project. The construction project data sheet will be submitted prior to completion of the preliminary design and establishment of the performance baseline (CD-2) in order that delays do not occur between design and start of construction.

5.2 Responsibilities

5.2.1 DOE-ID

DOE-ID will be responsible for implementing the project, including approval of specific procurement actions. The DOE-ID project manager will also establish the integrated project team and coordinate all CD reviews with DOE Headquarters.

5.2.2 BBWI

BBWI will be the operating contractor for development of the project's technical requirements, completion of the conceptual design, management and review of title design activities, procurement of selected equipment, checkout of systems, and operation of the completed project. BBWI project management will be provided by INTEC Infrastructure Projects.

BBWI will also provide construction management services, including constructibility reviews, coordination of long-lead procurement of construction materials and equipment, construction subcontracting, direction of the activities of construction subcontractors, and performance and management of construction activities as required to complete the project in a timely, safe, and cost-effective manner.

5.3 Project Phases

5.3.1 Conceptual Design

The conceptual design phase will validate project feasibility; identify project risks; and develop reliable cost estimates, equipment lists, performance schedules, functional relationships, a conceptual floor plan, and detailed design criteria. The acquisition strategy for conceptual design is to use the BBWI in-house Facilities Engineering organization, supplemented with specialized laboratory consultant expertise. The in-house engineering organization has sufficient personnel available with the knowledge of various existing facilities and systems to minimize the need to train new personnel or hire outside engineering organizations unfamiliar with the INEEL. Guidance provided by

HDR Architects (laboratory design specialists) during feasibility studies will also be used. During the conceptual design phase, BBWI will also prepare detailed design criteria for use by A-E during title design.

5.3.2 Title Design

During title design, final construction drawings, specifications, bidding documents, and cost estimates will be prepared. These items will be based on the approved conceptual design. The design phase will include review and comment periods at 30 to 35% (Title I) and 90% (Title II) design completion. The Title II design comment resolution will be used to generate the "approved for construction" packages for BBWI and DOE approval.

In general, title design services will be provided by an outside A-E operating under a fixed-price, lump-sum contract with BBWI or by in-house facility engineering personnel complemented with laboratory consultants operating under a time and materials agreement. The A-E will be selected based on the best value to the government. Use of an outside A-E will minimize the impact on in-house resources such that key designers and engineers can be released to work on other high priority fee-related projects. Designs for existing utility extensions and tie-ins will be performed by in-house BBWI staff. A dedicated team of discipline-specific BBWI independent reviewers will follow the project from cradle to grave. If a design/build/leaseback alternative is used, there will be two separate design efforts. One would perform services for the INTEC facility under BBWI direction and the other would provide services for the leased facility under direction of the private design/build firm. Should modifications to existing facilities be necessary, for example, to provide an expansion to CFA Medical to house dosimetry operations from CF-690, that design work would be performed by in-house engineering and design personnel.

Special activities such as the preliminary safety analysis report, final safety analysis report, National Environmental Policy Act (NEPA) documentation, and structural dynamic analysis requiring review by the Defense Nuclear Facilities Safety Board will be prepared by BBWI with A-E input.

The title design packages will include the conventional civil, structural, architectural, mechanical, electrical, and instrumentation designs. The INTEC facility design will assume for bid packaging purposes that one general subcontractor will be selected by BBWI Construction Management based on the best value to the government. As such, separate bid packages by craft or discipline will not be required.

5.3.3 Construction

In general, construction services will be obtained using a fixed-price subcontract obtained through a competitive bidding process. The subcontractor will be selected based on the best value to the government. The subcontractor will also be responsible for all major equipment (including hoods) for the project. This will eliminate issues historically associated with procuring government-furnished items, warehousing them before installation or causing delays to the subcontractor because of late delivery issues, or coordination/integration issues of government-provided items to systems constructed by the subcontractor.

Construction services will be obtained using a fixed-price subcontract obtained through a competitive bidding process.

Should a design/build/leaseback alternative be used, all bidding and construction subcontracting will be managed by the successful design/build firm. BBWI would provide oversight, since construction would likely occur on government grounds.

In some cases, BBWI direct-hire construction forces may be used to perform construction services. This generally occurs in areas where unknown radiological conditions exist, as-built conditions of the area are not well defined, or the work scope cannot be well defined because area conditions cause inaccessibility. In these instances, performing the work with fixed price subcontracts is not economical due to the large number of expected changed condition claims that will occur over the construction period.

This project proposes to utilize modifications to the normal project and construction management guidelines by implementing the “nine block” matrix to establish responsibility for subcontractor commercial practices for the INTEC facility. The project team, utilizing MCP-2514 “Management of Construction Project” has determined there are two phases of the project. Phase I (utility installation and tie-ins) was determined to be of Medium Construction Risk and Minimum Operational Interface Risk categories. The physical structure itself (Phase II) was determined to be of Low Construction Risk and Minimum Operational Interface Risk. Details on implementing commercial practices will be delineated during conceptual and title design effects. The design/build/lease facility would have very little oversight by BBWI. Strict commercial practices would be appropriate.

Construction management services will be provided by BBWI. The subcontractor will provide full-time quality inspectors; BBWI will provide quality oversight. The subcontractor will also provide a full-time safety professional. The subcontractor will work to his own preapproved safety plan. Safety oversight will be provided by BBWI. Key members of the project team will be co-located at or near the construction site to facilitate communications between the subcontractor and the project stakeholders.

5.3.4 Startup/Testing

A dedicated startup team comprised of BBWI operations and engineering personnel will perform startup testing after components constructed by the subcontractor are successfully checked out and tested. CD-4 will be requested for the project after successful operational readiness reviews. A phased move-in with separate assessments for each major facility relocation is planned following receipt of CD-4.

Move-in and relocation of existing facility equipment will be performed by BBWI direct hire construction forces.

6. PRELIMINARY RISK ASSESSMENT

A preliminary risk assessment was conducted for the ICLC Project as part of the mission need development process. It is included in separate CD-0 documentation. The purpose of this assessment was to identify technical risks beyond normal engineering practices that have the potential to adversely affect the ICLC design, construction, or operation. The assessment followed the DOE Program and Project Management Practice 8, “Risk Management.” The categories of technical risk addressed were: (a) safety/radiological, (b) design/construction, (c) environmental/regulatory, (d) project support, (e) procurement/contracting, and (f) resource availability.

Risks have been categorized as high, medium, or low. The strategy for managing all areas that are categorized as low is to monitor activities pertaining to these areas as the project progresses to ensure that the risk does not escalate. Management of the categories in the low range will use standard cost and schedule contingencies in the baselines to mitigate effects of the risks.

The medium risk categories have potential impacts to the project but are considered to be manageable with proper planning and monitoring to ensure they do not escalate. The risks will be monitored during project execution and status provided at CD points.

Table 6 identifies the currently known major project risks and recommended mitigations. At the pre-conceptual stage, uncertainty is at a very high level and risk is best described in terms of scope, schedule, and cost elements. As the design progresses, awareness of risk increases and more specific risk quantification is possible. As required by DOE Order 413.3,[4] a more formal risk management plan will be developed in the conceptual phase and will be maintained throughout the life of the project.

Table 6. Major project risks.

Risk Description	Potential Mitigation
Changing Project Mission and Objectives: • Will the project be designed to support vitrification analyses in the future? • What is the project scope and schedule? • How much technology development space from CPP-637 should be included? • How much new mission space for subsurface science and other nuclear research should be included?	Early and final decisions related to project mission and objectives are crucial to maintaining schedule and cost baselines. Planning for future upgrades to handle vitrification or reprocessing analyses or technology development related to vitrification or reprocessing will also be costly. The impacts and amount of NRC involvement in the design, construction, and operation of the facility must also be defined. An organized, integrated project team can ensure that project objectives are fixed and that the acquisition process is implemented to achieve project success.

Table 6. (continued).

Risk Description	Potential Mitigation
Technical maturity of facility processes, systems, and components: The ICLC will not house a vast array of complex or new technologies. It will generally be constructed with off-the-shelf technologies and equipment. A key to efficient operations will be the location of specific functions as they relate to each other within the facility. At this stage of the project, specific functions, interfunction relationships, and system requirements are not well defined. Poor planning and system requirements definition will lead to extensive field problems, potential redesign efforts, an extended construction schedule, and potentially unusable portions of the facility.	Subcontracting with experienced laboratory designers and obtaining their “lessons-learned” experiences as well as those from other DOE sites (particularly SRS, Pantex, and Sandia) and Bechtel resources will validate design assumptions, reduce system design risks, and enhance engineering efforts. Design reviews by independent subject matter experts will also contribute to the success of the design. Adequate time and effort will be spent during the conceptual and preliminary design phases to identify and eliminate weak technical bases. Where possible, the design and fabrication of key process equipment/systems will be subcontracted to firms with proven capabilities in similar system technologies. This will reduce risks and shorten design/fabrication schedules. **Technology is considered a medium risk, since proven and off-the-shelf technologies will generally be employed in the construction of the facilities.**
CD Approval Cycles: Staffing requirements to perform conceptual and title design for a project of this complexity are numerous. Interruption of design during review and approval at the end of each phase will be costly.	A method to keep the project progressing toward completion of each acquisition phase must be developed. As a team approach, a leader from each external reviewing organization should be assigned as a member of the integrated project team. The review teams must provide constant feedback to the project throughout the execution of each phase and present issues to the integrated project team for early resolution. **Schedule risk is considered low because of the CD process impacts. Completion of this project by a particular date is not critical to other contractors, projects, or programs**.

Table 6. (continued).

Risk Description	Potential Mitigation
Safety/Radiological Health: Health and safety is paramount to laboratory operations. If exposure or potential exposure or release to the environment of radiological or chemical material is identified, laboratory operations will stop until the condition is rectified. There will be downtime costs as well as rework/redesign costs and adverse schedule impacts.	Utilize frequent informal communications with the laboratory planner about potential problems. Provide very specific, detailed design criteria up front. Utilize formal communications and documentation for all decisions. Identify chemical, hazardous, and radiological materials and quantities that will be housed and used in the facility. Provide a formal evaluation of radiological and chemical protection design and laboratory layout during design reviews. **Safety risk is considered medium, since activities within the project could injure project participants if hazards are not mitigated.** **Radiological risk is considered high, since the project will be dealing with HLW sample analyses.**
Inadequate Technical and Functional Requirements: Inadequate T&FRs cause rework and redesign, which increase costs and adversely affect the schedule. This results in revisiting with the stakeholders, incompatible requirements or not meeting the users needs, and jeopardizing completion of the laboratory mission.	Identify specific design criteria up front. Obtain formal agreement and acceptance by the stakeholders. Acquire authority for coordinating all the requirements, and hold points of contact accountable. Involve all major players (including telecommunications, infrastructure, services, and scientists) throughout the process. Coordinate with the DOE complex about other activities across the complex. **Technical requirements risk is considered medium, since there are several users, multiple systems, and varying needs required by each user**.

Table 6. (continued).

Risk Description	Potential Mitigation
Environmental/Regulatory: Changes in regulatory requirements for NEPA, RCRA, air, floodplain, and other permit applications or assessments may occur throughout the project.	**Environmental risk is considered medium, since the ICLC will be dealing with hazardous wastes that have been characterized as moderate.** **Regulatory risk is considered medium, since the project will involve the Idaho Department of Environmental Quality approvals and an environmental assessment.**
Funding: Funding for design/construction is uncertain with respect to amount or timeline.	Ensure submitted documentation is justified and defendable. Keep upper management informed. **Funding risk is considered high, since the project will be funded in three or more yearly increments and the TPC is greater than $50 million.**
Senior Management Support: There is little or no senior management support for the project.	Develop compelling drivers to convince DOE Headquarters to support the project. Maintain good, open communications with upper management. Develop a good presentation strategy to DOE and BBWI management. Invite congressional staffers to visit the existing facilities after the conceptual design is complete. **Public involvement risk is considered low, since little public involvement is expected.** **Political visibility risk is considered medium, since upper-level management will be involved in the project due to its size and importance to the INEEL.**
Procurement/Contracting: ICLC construction involves a different contracting strategy utilizing a commercial contract not subject to normal INEEL operating constraints.	Obtain approval of mission need documents to gain DOE support. Show cost/benefit comparisons for the procurement alternatives. Obtain management buy-in up front.

Table 6. (continued).

Risk Description	Potential Mitigation
In-house Support: Qualified in-house support is unavailable, resulting in poor designs, poor reviews, poor T&FRs, failure to meet mission requirements, schedule delays, and additional costs to hire and train qualified personnel.	Evaluate subcontractor qualifications. Evaluate internal expertise, and obtain management support to assign qualified personnel. Define qualification needs. **Support risk is high, because multiple end users and several key internal interfaces exist; in addition, the INEEL will be undergoing a substantial reduction in force in early FY 2002**.

7. PRELIMINARY NEPA AND PERMITTING STRATEGY

Since the ICLC is not specifically referenced in the *High-Level Waste Environmental Impact Statement*, an environmental assessment determination will be prepared during the conceptual design phase and submitted to the BBWI Environmental Affairs Department. Environmental Affairs will develop the appropriate level of NEPA documentation required to ensure that:

- The project will not violate applicable statutory, regulatory, or permit requirements for the environment, safety, or health, including requirements of DOE orders.
- Environmentally sensitive resources are not adversely impacted. This includes historical, archaeological, or architecturally significant properties; federally or state listed threatened or endangered species or their habitat; floodplains and wetlands; and special sources of water, such as sole-source aquifers, wellhead protection areas, and other water sources that are vital to the region.
- No uncontrolled releases or movement of hazardous substances, pollutants, contaminants, CERCLA-excluded petroleum and natural gas products, or nonnative organisms occur in the environment.
- Air permitting requirements are evaluated by cognizant professionals and applicable permit applications are submitted and approved.
- Chemicals used during the project are purchased, inventoried, handled, tracked, stored, and disposed of in accordance with local, state, and federal regulations.
- Cognizant professionals provide project support for activities conducted in areas potentially contaminated with radiological, chemical, or other constituents that may disturb the area (that is, CERCLA Area of Contamination).
- Plans and specifications for construction of drinking water systems are submitted to, and approved by, the State of Idaho.
- Activities comply with the General Permit for Storm Water Discharges from Construction Activities.
- Aboveground storage tanks and/or belowground storage tanks are properly permitted for purchase, construction, operation, relocation, or modification.
- Project activities do not generate wastes that have no means of disposition, the wastes meet all applicable requirements, and all waste-generation activities integrate pollution prevention and waste minimization.
- Currently unknown environmental requirements or permits will not delay the project.

BBWI Environmental Affairs, as part of the assessment process, will identify required permitting. Actions will likely be required for storm water pollution prevention, RCRA permit reviews, soil disturbances, potable water modifications, cultural resource clearances, and other related permits. Numerous new air emission sources will exist, since each laboratory will contain multiple hoods.

8. PROJECT TECHNICAL AND ORGANIZATIONAL INTERFACES

Major participants and key areas of responsibility on this project are shown in Table 7; organizational interfaces are shown in Figure 18.

Table 7. Major participants and key areas of responsibility.

Name	Organization	Responsibility
Bill Harker	DOE-ID Projects	DOE-ID Project Manager
Michael Wilberg	BBWI Infrastructure	BBWI Project Sponsor
Kirk Winterholler	BBWI Projects	BBWI Project Manager
Brent Helm	BBWI Facility Engineering	BBWI Project Engineer
Joe Henscheid	BBWI Analytical Laboratories	Analytical Laboratories (CPP-602, -630, CF-625, -612, TRA-604, -661, Advanced Mixed Waste Treatment Facility for PCBs)
Mike Dunlap	BBWI Development Laboratories	Process and Development Laboratories (CPP-637, -620)
Paul Ritter	BBWI Subsurface Laboratories	Subsurface Science Initiative – High-Level Laboratory (TBD)
Doug Carlson	DOE-ID Radiological/Environmental Laboratory	DOE-ID RESL (CF-690, -638)
Paul Ruhter	BBWI Dosimetry/Bioassay	Dosimetry and Bioassay Laboratories (CF-690, -625)
Leah Street	BBWI Site-wide Monitoring	Soils Laboratories (CF-689)
Doug Gail	Stoller Corporation Environmental Monitoring	Food and Game Laboratories (CF-689)
Jerry McCarthy	BBWI Systems Engineering	Project Systems Engineer
Byron Blakely	BBWI Facility Design	Architectural Designer and Project Consultant
Jack Cleveland	BBWI Infrastructure	Funding and Budgeting
Chad Cornelison	BBWI Environment, Safety, & Health (ES&H)	Overall ES&H Project Responsibility
Steve Aitken	BBWI ES&H	Radiological Engineer

Table 7. (continued).

Name	Organization	Responsibility
John Irving	BBWI ES&H	NEPA Compliance
Jeff Rehor	BBWI Safety Analysis	Preliminary/Final Safety Analysis Report
Mike Barnes	BBWI Procurement	Subcontract Administration
Lex Strain	BBWI Construction Management	Construction Management
Reed Ashby	BBWI Quality	Quality Engineer
Paulette Waterson-Adams	BBWI Projects	Program Controls
Stuart Jensen	BBWI INTEC Engineering	Dynamic Structural Analysis
Alex Orihuela	BBWI Projects	Scheduling
Doug Wood	BBWI Land/Facility Operations	INTEC Planner
Paul Snyder	BBWI Land/Facility Operations	CFA Planner

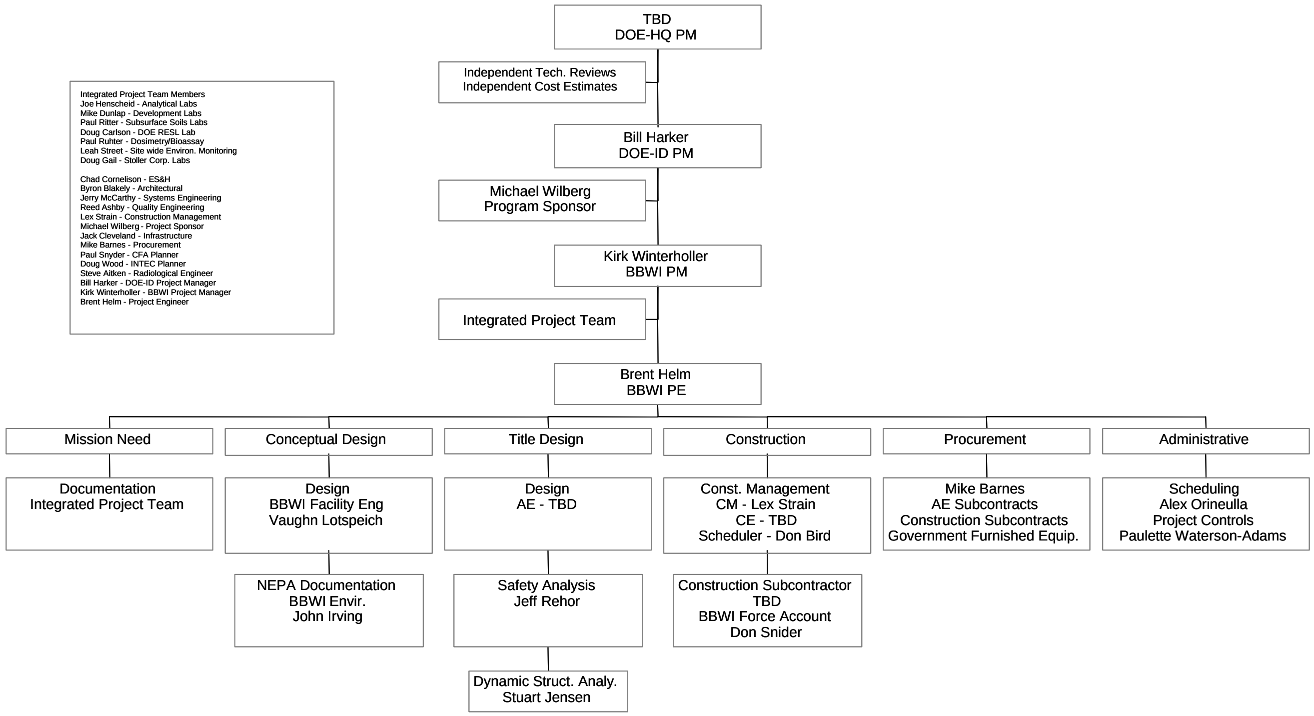


Figure 18. Organizational interfaces.

Appendix A

Life Cycle Needs

Table A-1. Avoided Infrastructure Life-Cycle Capital Cost Needs ($K) FY 02 – 10 Resulting from INEEL Consolidated Laboratory Complex Project LICP.

Infrastructure Project/Activity	Funding Type	Funding Years	FY-02	FY-03	FY-04	FY-05	FY-06	FY-07	FY-08	FY-09	FY-10
CENTRAL FACILITIES AREA (CFA)											
CFA-690 Radiological and Environmental Sciences Laboratory (RESL) HVAC, Electrical and Structural Upgrades	GPP	2003		4,978							
CFA-625 Roof Replacements	GPP	2004			392						
CFA-612 Office and Laboratory New Roof	GPP	2006					150				
CFA-612 Office and Laboratory HVAC Upgrades	GPP	2008							100		
CFA-625 Laboratory Complex HVAC Upgrades	GPP	2009								80	
CFA-612 Office and Laboratory Mechanical Upgrades	GPP	2010									150
IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER (INTEC)											
INTEC Consolidated Laboratory Facility	LICP	2001-08	758	4,105	4,288	1,451	50,683	45,000	42,812		
CPP 637 Process Improvement Facility Electrical/HVAC Upgrade	GPP	2004-05			596	4,020					
CPP-620 Chem. Eng. Lab. High Bay Electrical/HVAC/Mechanical Upgrades	GPP	2009								180	
CPP-620 Chem. Eng. Lab. High Bay Roof Upgrade	GPP	2010									67
CPP Office Facility Replacement 602/630	GPP	2005				4,576					

Total Avoided Life-Cycle Capital Costs Through FY 2010 = $164,386K

Appendix B

Cost Estimates and Life Cycle Cost Analysis

Assumptions used in the Economic Analysis of the Consolidated INEEL Laboratory Complex (CLC)

All options assume, overnight construction, 36 years of continuos operation, and the decommissioning, decontamination, and disposal of the facility.

All capital cost estimates for new construction (Options 2, 3, 5, and 6) and the improvement of existing facilities (Option 1) were provided. Estimates on the maintaining and remodeling the existing facilities and new facilities were based current costs, best engineering judgement, and parametric estimating techniques.

Existing operation costs of approximately $31 per square foot are based on current INEEL experience, validated against the Long-Range Plan. Operation costs for newly constructed laboratories is estimated at $16 to $17 per square foot and is parametrically based on the existing operation cost. It is assumed that any minor, major, or overall remodel will not reduce the current cost of the maintaining the existing facilities; it will merely slow down the exponential growth in the cost in planned and unplanned maintenance activities and that of future remodels.

Parametric estimates are as follow:

The facilities of Option 1 will require planned and unplanned maintenance costs of $31 per square foot annually. However, because this option mitigates many of the maintenance problems at the existing facilities, we can assume a relatively slow but steady increasing rate in the cost of maintaining these older facilities. For this reason, we have assumed an annual planned and unplanned maintenance cost of 2.5% of the current replacement cost, and 5% and 7% for minor and major remodels every 7 and 15 years, respectively. Nonetheless, identical to existing facilities (assumes $50 million remodel will mitigate current deficiencies but not mitigate the effects of age on these aging facilities). However, this capital project will reduce the direct operations cost by 25% (assumes upgrades will improve insulation, lighting, certain aspects in cleaning such as improved floor coverings, and in other utilities.) This capital project will not improve the operation costs for securing the facilities, but will improve and reduce the cost of mitigating safety concerns.

Being constructed of modern materials and employ better construction techniques, the facilities of Option 2 and 3 should experience a significantly reduced planned and unplanned maintenance cost from the existing facilities basis. It has been assumed that these facilities will experience an annual operation cost of approximately $16.50 per square foot due to the integration of better insulation, lighting, cleaning, and utilities. The effects of age should increase these costs; however, at a significantly reduced rate of 1.0% annually given the age and modern materials employed. It has been conservatively assumed that these integrated facilities will not improve the operation costs for securing the facilities, although it would be reasonable to assume that one integrated facility is easier to monitor than many dispersed facilities. It has been assumed that a state-of-the-art laboratory will reduce the cost of mitigating safety concerns by 40%.

Option 4 explores the current strategy of patching and repairing of facilities as needed. This strategy must assume a significantly increasing cost to maintain these facilities as they and their supporting utilities will approach 75 to 100 years of age. It is also assumed that the existing facilities must experience increasing planned and unplanned maintenance costs, increasing from the current $32 per square foot per year by a minimum of 2% to 3% per year and significantly increasing the years after as major building components begin to fail. This capital project will not experience increased costs in securing the facility but will experience increased costs of safety concerns as these problems impact operations and require additional mitigation.

Option 5 is identical to Option 2 except in that there is no new $30.0M laboratory facility. For this reason, Option 5 will not meet programmatic requirements and cannot be considered programmatically viable but is provided for information only. The operation costs were assumed equal.

The new facility of Option 6 should experience operation costs similar to Options 2 and 3, based on a percentage of the original acquisition cost and the number of square feet.

The economic effectiveness of all options were evaluated using the present value methodology outlined in the *OMB Circular A-94 LCC, Guidelines and Discounts Rates for Benefit-Cost Analysis of Federal Programs.* A-94 assumes a current discount rate of 5.3% on inflated costs and an inflation rate of 3.0%.

INEEL Laboratory System Evaluation
Comparison of LCC Results

	discounted LCC per square foot	discounted LCC (5.30% discount rate)	inflated cash flow (3.00% inflation rate)
OPTION 5: Build One 160,000 sqft, $98M Lab @ INTEC	$18.50	**$215,355**	$434,192
OPTION 3: Build One 150,000 sqft Lab @ INTEC & Lease 60,000 sqft Low-Level Rad Lab in Town	$19.26	**$242,072**	$499,593
OPTION 2: Build One 160,000 sqft Lab @ INTEC & One $30 Million Low Level Rad Lab @ CFA	$19.24	**$269,257**	$535,928
OPTION 6: Build One 220,000 sqft, $150M Lab @ INTEC	$23.18	**$269,847**	$503,030
OPTION 1: Upgrade Existing Laboratories with $80 Million of Improvements	$28.51	**$289,002**	$667,052
OPTION 4: Refurbish Existing Laboratories as Status Quo	$30.96	**$312,486**	$947,858

Appendix C

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Appendix C

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